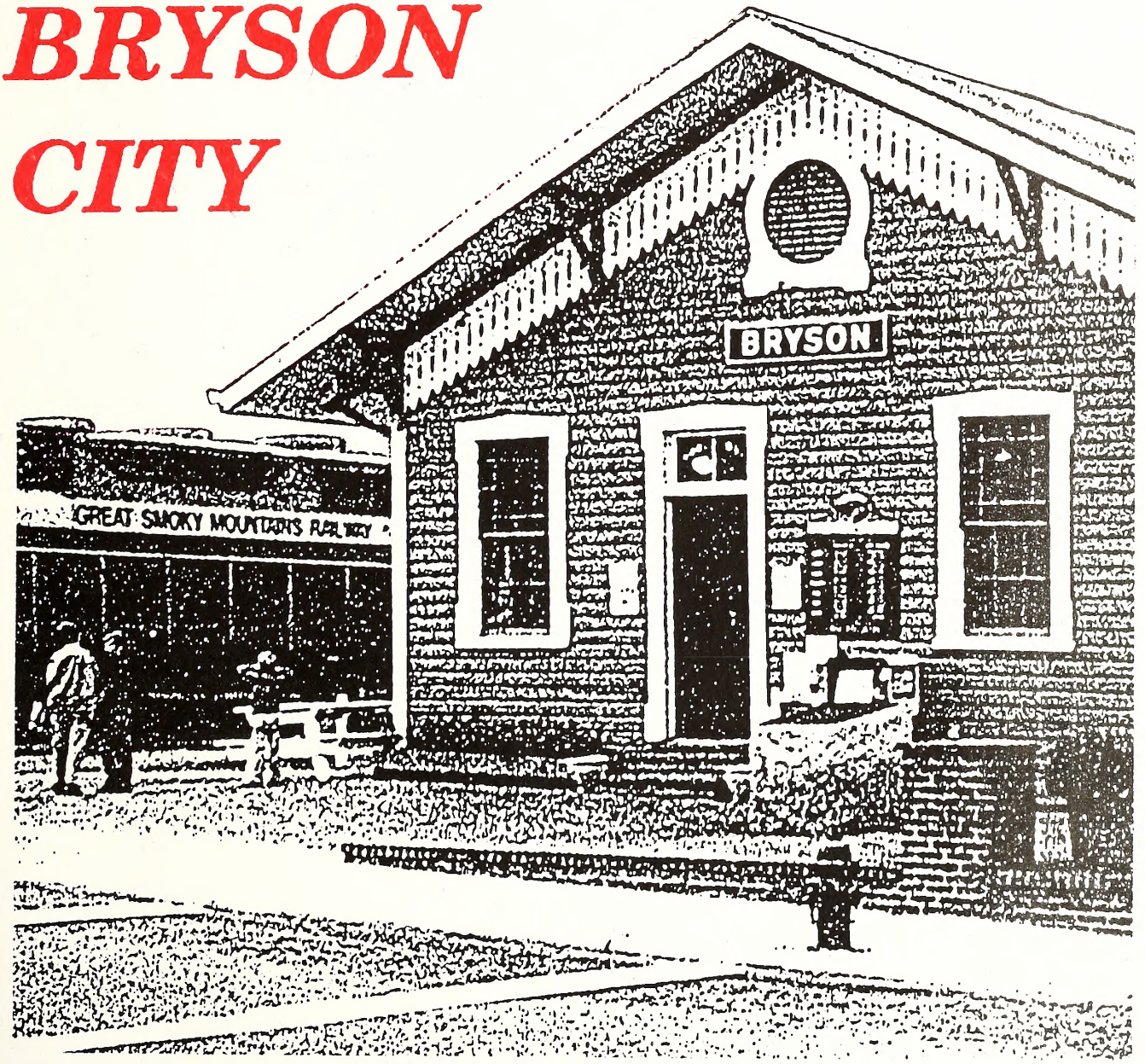
North Carolina Department of Transportation
Statewide Planning Branch

Thoroughfare Plan for

BRYSON CITY



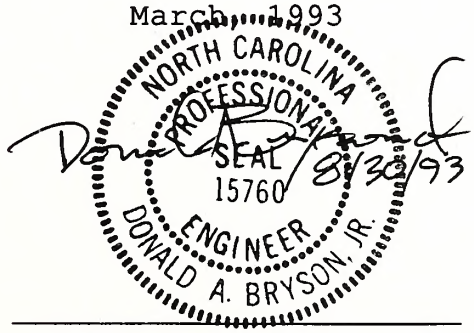
March 1993

THOROUGHFARE PLAN
FOR THE
TOWN OF BRYSON CITY

Prepared by the:
Statewide Planning Branch
Division of Highways
North Carolina Department of Transportation

In Cooperation with:
The Town of Bryson City
Swain County Economic Development Commission
The Federal Highway Administration
U.S. Department of Transportation

March, 1993



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ACKNOWLEDGMENTS

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150 copies of this document were printed at a cost of $311.90, or $2.08 per copy (GS. 143-170.1).

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I. INTRODUCTION

Transportation has played a vital role in the history of Bryson City. Originally an isolated, unincorporated village known as Charleston, it has been the site of the county seat of Swain County since 1871. By the time the town changed its name to Bryson City in 1889, progress in transportation had already begun to reshape the community, and to redefine its social and economic roles in the region.

Stagecoach and hack-line service between Asheville and Murphy began in 1870. The trip took three and a half days each way, and for some time there was no regular stop at Charleston because of a lack of facilities for meals and lodging. A major change was initiated in 1884, with the arrival of the railroad. Not only did the accessibility provided by train service reduce the community's isolation, it spurred economic development, particularly in the timber and mining industries. Bryson City soon became an important stop on the single-track line connecting Murphy and Asheville. In addition to freight service, four passenger trains a day stopped in Bryson City for meals.

Although its economic and social impacts may be more obvious, the railroad also influenced the actual physical form of Bryson City. The town square and most of the earliest business establishments were to the south of the Tuckasegee River. The location of the railroad on the north side of the river shifted the focus of commercial activity. Milling, woodworking, and manufacturing operations sprung up near the tracks. Passengers required food and lodging, so there was soon a hotel and some rooming houses in the vicinity. Before long, a variety of other new businesses were also attracted to the north side of the river.

The division of Bryson City into two sections, "north of the river" and "south of the river," points out the importance of geographic features in influencing both land use and transportation. The rugged mountain terrain that has historically isolated the region from the rest of the state has also dictated the location of development. Bryson City has naturally grown along the banks of the Tuckasegee River, at least where the valley is wide enough to make it practical. Transportation routes have also followed the river, regardless of the vehicle used -- canoe, stagecoach, train, or car. Crossing the river has always been an important need, a need met over the years by a variety of ferries and bridges. The advent of the automobile made this an even more critical consideration. Trips of all types and from all directions funnelled through town and across the Everett Street bridge until the early 1970's, when the opening of the Slope Street bridge finally provided an alternative crossing.

The first automobile trip to Bryson City was made in 1913, and within a year several residents purchased cars of their own. But without a system of good roads, the automobile could never become a practical, dependable means of transportation. By the 1930's, however, the road system had improved to the point that trucks and cars were becoming essential parts of everyday life. Buses were already competing with passenger trains, a competition the bus would win in 1949, when passenger train service to Bryson City ended.

The proliferation of the automobile combined with improved roads to increase tourism dramatically. The region's spectacular wilderness areas became more accessible to people in the expanding urban centers of the Southeast. The growing popularity of the Smokies as a recreational area contributed to the creation of the Great Smoky Mountains National Park, which in turn further increased tourism. While the park designation ensured the preservation of a priceless natural resource, it also exacted a heavy social and economic toll from local residents. Government takeover removed vast tracts of land from the local tax base. Economic activity shifted from logging and mining to tourism. Many people lost their homes, their livelihoods, or both, and left the area. By 1970 the county population was 8835, only two-thirds of its 1920 peak of 13,224. Yet increasing tourism has generated significant traffic growth, resulting in seasonal congestion problems. Meanwhile, the same roads that have provided tourists with easy access to the Smokies have also made it easier for local residents to travel elsewhere for shopping and employment opportunities.

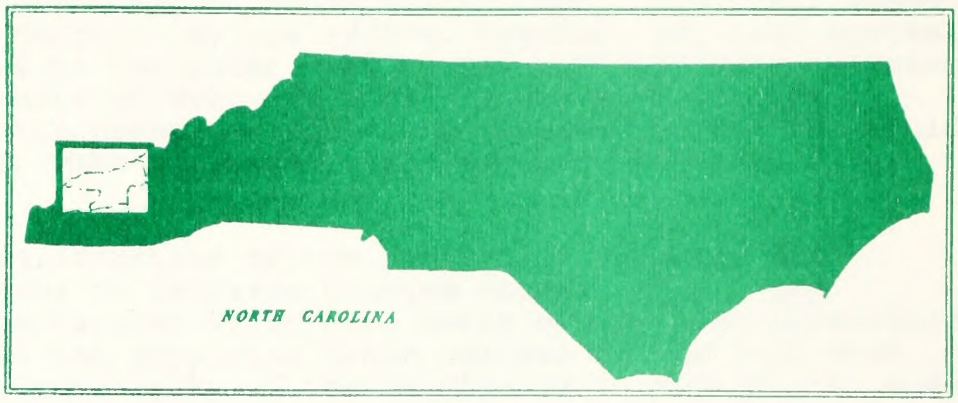
Bryson City's future appears more promising. The low cost of living compared to more popular resort areas has been attracting retirees and second homeowners. Passenger rail service has returned to Bryson City in the form of the Great Smoky Mountains Railway, a popular excursion train with potential for stimulating related commercial activity in the central business district. Ironically, the success of the train is creating parking problems, as well as automobile and pedestrian congestion, in the vicinity of the depot.

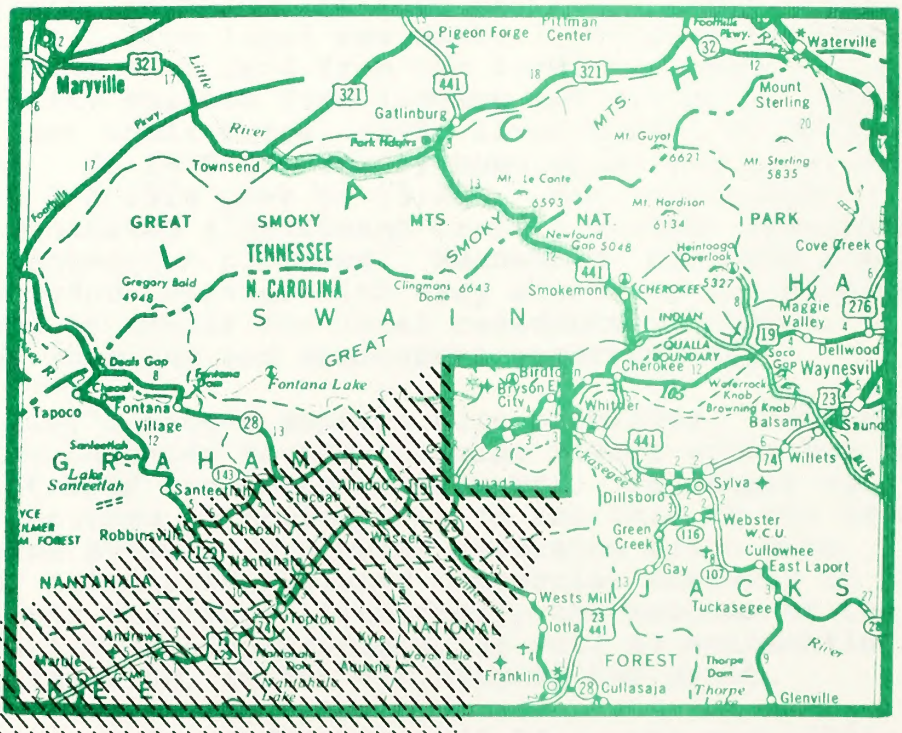
Construction of the four-lane US 74 in the mid-1970's improved accessibility from the north and east. The new Intrastate Highway System identifies US 74 as the primary corridor between Asheville and Murphy, and the entire final link from Bryson City to Andrews is on the way to completion. This facility will carry growing traffic from the south and west, including Atlanta and Chattanooga. The challenge facing Bryson City lies in making sure people use the improved US 74 to get **to** Swain County, not just **through** it. At the same time, care must be taken to ensure that "success" does not damage the priceless natural features that provide the key to economic development. Bryson City's future

prosperity depends on maintaining the delicate balance between preserving a unique environment and providing reasonably convenient access to it.

FIGURE I.1

BRYSON CITY LOCATION





II. THOROUGHFARE PLANNING PRINCIPLES

Objectives

The urban street system typically comprises 25 to 30 percent of all developed land in an urban area. The expense of building and maintaining a permanent system of this magnitude requires a careful, comprehensive decision-making process. Public officials use the thoroughfare planning process to identify the most appropriate street system to meet existing and future travel demands.

The main purpose of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with changing traffic patterns. A thoroughfare plan enables street improvements to be made as traffic demands increase, reducing expenses by helping eliminate unnecessary improvements. Coordinating improvements to the urban street system with increases in traffic demand maximizes the use of the system while minimizing its land requirements. In addition to meeting traffic needs, the thoroughfare plan should foster a pleasing and efficient urban community by incorporating sound urban planning principles. The locations of major streets and highways are influenced by both the location and magnitude of existing and anticipated residential, commercial, and industrial development. Conversely, the placement of major streets and highways will affect urban land use patterns.

Other objectives of a thoroughfare plan include:

1. providing for the orderly implementation of an adequate major street system as land development occurs,

2. reducing travel and transportation costs,

3. lowering the cost to the public of major street improvements by coordinating with private action,

4. enabling private interests to plan their actions, including specific projects and improvements, with full knowledge of public intent,

5. minimizing disruption and displacement of people and businesses through long range planning for major street improvements,

6. reducing environmental impacts (such as air and noise pollution) related to transportation, and

7. increasing travel safety.

Thoroughfare planning objectives are achieved by improving the operational efficiency of thoroughfares, and by improving the system efficiency through system coordination and layout.

Operational Efficiency

The operational efficiency of a street is improved by enabling the street to carry more vehicles and people. In terms of vehicular traffic, a street's capacity is the maximum number of vehicles that can pass a given point during a given time period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, by the nature of its traffic, and by climate and weather conditions.

Physical modifications that increase vehicular capacity include widening streets, improving intersections, enhancing vertical and horizontal alignment, and eliminating roadside obstacles. For example, widening a street from two to four lanes more than doubles the capacity of the street, since traffic is can maneuver more freely. This minimizes traffic impedances caused by slow-moving or turning vehicles, and reduces the adverse effects of a deficient horizontal or vertical alignment.

Operational improvements to street capacity include:

1. *Control of access* -- A roadway with complete access control can often carry three times the traffic handled by a non-controlled access street with identical lane width and number. US-74 is the only facility in Bryson City with fully-controlled access.

2. *Parking removal* -- Eliminating on-street parking can increase capacity by providing additional street width for traffic flow, and by reducing the friction to flow on-street parking creates. The 1989 Bryson City Traffic Study, prepared by NCDOT's Traffic Engineering Branch as part of the Municipal Traffic Engineering Assistance Program, identifies various parking problems and recommends solutions for improving traffic flow.

3. *One-way operation* -- Depending on turning movements and overall street width, converting to one-way traffic operations can increase the capacity of a street by 20% to 50%. One-way streets also can improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination. The configuration of the street network, the traffic patterns, and the relatively low volumes found in Bryson City do not lend themselves to one-way operation.

4. *Reversible lanes* -- Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods. Bryson City does not exhibit the high-volume directional flows needed to warrant reversible lanes.

5. *Signal phasing and coordination* -- Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation. The Bryson City Traffic Study addresses signalized intersections.

Altering travel demand is a third way to improve the efficiency of existing streets. The population in the Bryson City area is too low for travel demand reduction techniques to be viable, but they will be discussed briefly. Travel demand can be reduced or altered in the following ways:

1. Encourage people to form carpools and vanpools for journeys to work and for other trip purposes. This reduces the number of vehicles on the roads and increases the number of people the street system can carry.

2. Promote the use of transit and bicycle modes.

3. Encourage industries, businesses, and institutions to stagger work hours or to establish variable work hours. This will spread peak travel over a longer time period, reducing peak hour demand.

4. Plan for and actively promote land use development or redevelopment that encourages more efficient travel patterns. Future land use in Bryson City could be coordinated to match travel demand with supply, but non-transportation factors (such as water and sewer service, topography, and economic conditions) are understandably more critical to land use decisions.

System Efficiency

Another way to change travel demand is by developing a system of streets that serves travel desires more efficiently. Such a street system can reduce the distance, time, and cost requirements of travel. Improvements in system efficiency can be achieved by applying the principles of functional classification to develop a coordinated major street system.

Functional Classification

Streets carry out two primary functions -- traffic service and land access -- that are incompatible in the same facility. The conflict is not serious if both traffic and land service demands are low. When traffic volumes are high, however, conflicts created by uncontrolled access and intensely used abutting property lead to intolerable traffic flow friction and congestion. This is a significant problem in Bryson City. Topographic, environmental, and economic constraints limit road building opportunities, so many roads have been providing both

land access and traffic service. Before the opening of US-74, which relieved much of US-19's through-traffic burden, US-19 was a good example of this problem.

The underlying goal of a thoroughfare plan is to provide a functional system of streets that permits direct, convenient, safe travel. Different streets in the system should carry out specific functions, minimizing the traffic and land service conflict. Streets are categorized by function as local access streets, minor thoroughfares, or major thoroughfares (See Figure II.1). The function of a road can vary along its length, depending on adjacent land use and on the road's relationship to the rest of the street system. The categorization of each facility should be as consistent as possible, however.

Local access streets provide access to adjacent property. They are not intended to carry heavy volumes of traffic. A local access street should be designed and located to serve only traffic originating from or destined for that particular street. Local streets may be further classified as residential, commercial, and/or industrial depending upon the type of land use that they serve. In Bryson City, examples of local streets include Fryemont Street, Jenkins Branch Road, and Greenlee Street.

Minor thoroughfares play a more important role in the street system. They collect traffic from local access streets and carry it to the major thoroughfares. Sometimes they supplement the major thoroughfare system by expediting minor through traffic movements. They may also provide access to adjacent property. Minor thoroughfares should be designed to serve limited areas, discouraging their development into major thoroughfares. Examples of minor thoroughfares include Hughes Branch Road and Mitchell Street.

Major thoroughfares are the primary traffic arteries. Their function is to move traffic between and within cities. Major thoroughfares occasionally serve abutting property, but their principal function is to carry traffic. They should not be bordered by uncontrolled strip development, since such development significantly reduces the capacity of the thoroughfare. Every driveway is a safety hazard, introducing multiple vehicle conflicts and impeding traffic flow. Major thoroughfares range from two-lane streets carrying low volumes of traffic, to major expressways with four or more heavily used traffic lanes. Parking normally should not be permitted on major thoroughfares. US-74, US-19, and Gibson Street (SR-1321) are all major thoroughfares.

Idealized Major Thoroughfare System

A coordinated system of major thoroughfares forms the basic framework of the urban street system. In most cases, the system that best matches an urban area's travel desire lines is the radial-loop system. This system permits more direct movement

between various areas. It consists of several functional elements: radial streets, crosstown streets, loop streets, and bypasses (Figure II.1). Although geography severely limits the degree to which an idealized thoroughfare plan could ever be implemented in Bryson City, understanding the concept can help in identifying and solving problems in the thoroughfare network.

Radial streets provide for traffic movement between points located on the outskirts of the city and the central area. This is a major traffic demand in most cities, and the economic strength of the central business district depends on an adequate system of radial thoroughfares. Spring Street, Slope Street, and US-19 act as radial streets.

If all radial streets crossed in the central area, intolerable congestion would result. To avoid this problem, a system of *crosstown streets* forming a loop around the central business district is necessary. This system allows traffic to get from one side of the central area to the other to without having to pass directly through the central area. It also allows central area traffic to circle the area and then enter near a specific destination. The effect of a good crosstown system is to free the central area of traffic that does not want to be there, reducing conflicts with business and pedestrian activities. Bryson City's topography limits the availability of crosstown facilities, resulting in additional congestion on radial streets. The opening of the Slope Street bridge has allowed Slope Street to serve to some degree as a crosstown street.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they help relieve congestion in central areas. There may be one or more loops, depending on the size of the urban area. The intensity of land use determines the spacing between loops, which typically ranges from one-half mile to one mile. There are no loops in Bryson City, due again to its small size and topography.

A *bypass* carries traffic through or around the urban area, relieving the city street system by removing traffic that has no need to be in the city. Bypasses are usually designed to through-highway standards, with controlled access. Occasionally, a bypass with low traffic volume can serve as a portion of an urban loop. In general, bypasses expedite the movement of through traffic and improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses can increase the economic vitality of the local area. US-74 is an example of a typical bypass.

Application of Thoroughfare Planning Principles

Operational efficiency, functional classification, and the idealized major thoroughfare system are all conceptual tools available to the transportation planner for developing thoroughfare plans. In actual practice, thoroughfare plans are created for established urban areas. They are constrained by existing land use and road networks, public attitudes, goals, and expectations of future land use and travel patterns. These constraints combine with all the other factors affecting street locations to make compromises necessary. Complicating the process further is the need for long-range projections concerning economic, social, and technological conditions. Obviously these forecasts involve a degree of uncertainty, and an awareness of this uncertainty is required to minimize the risks associated with such potentially significant commitments of public and private resources.

IDEALIZED THOROUGHFARE PLAN

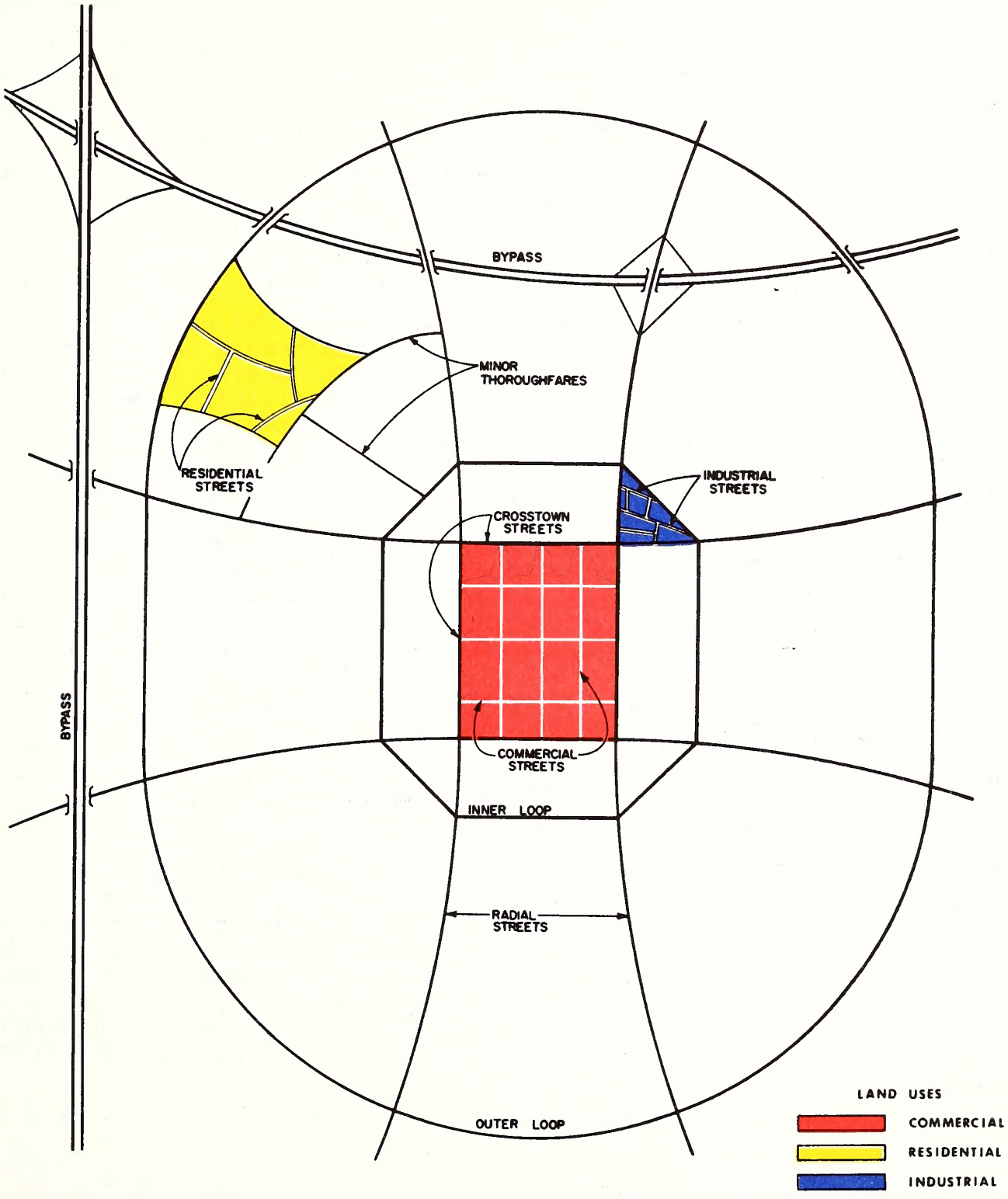


FIGURE II.1

III. EXISTING THOROUGHFARE PLAN

Plan Development

The first Bryson City Thoroughfare Plan was adopted in 1967. The plan consisted mainly of a system of existing radial streets, US-19 being the most important. The plan also identified several facilities on new alignments, including the Slope Street extension and Alternate US-19 (now US-74). The plan was revised once, in 1983, to reflect the completion of these two projects (see Figure III.1). Only two proposed facilities remain on the current plan: the Depot Street realignment and a connector between SR-1328 and SR-1340.

The opening of US-74 dramatically altered traffic patterns in and around Bryson City. Its superior alignment and control of access offers a faster, safer alternative to US-19. US-74 effectively serves two roles in Bryson City's transportation system. It acts as a bypass, shifting through traffic out of CBD congestion and allowing US-19 to operate more efficiently in providing for local travel and land access. As a result, both truck traffic and accidents in the CBD have been reduced. US-74 has also improved the accessibility of Bryson City to other regions, increasing its attractiveness as a recreation, retirement, and business location. At the same time, US-74 has expanded employment, shopping, and recreation opportunities for local residents by improving regional mobility.

On a local level, US-74 has combined with the construction of the Slope Street bridge to change Spring Street from a minor collector to a major thoroughfare. Spring Street now serves as the primary gateway to town, while the Slope Street bridge affords relief from crosstown traffic congestion.

Although US-19 does not play the same role it did prior to the completion of US-74, it is still a critical part of the Bryson City thoroughfare plan. US-19 provides access to residences and businesses, and connects the various radial roads that characterize the network. This is a critical function, since topography severely limits circumferential connections between these radial roads. Almost all travel within and through Bryson City must use US-19 at some point.

FIGURE III.1
BRYSON CITY THOROUGHFARE PLAN
ADOPTED 1967 REVISED: 1983

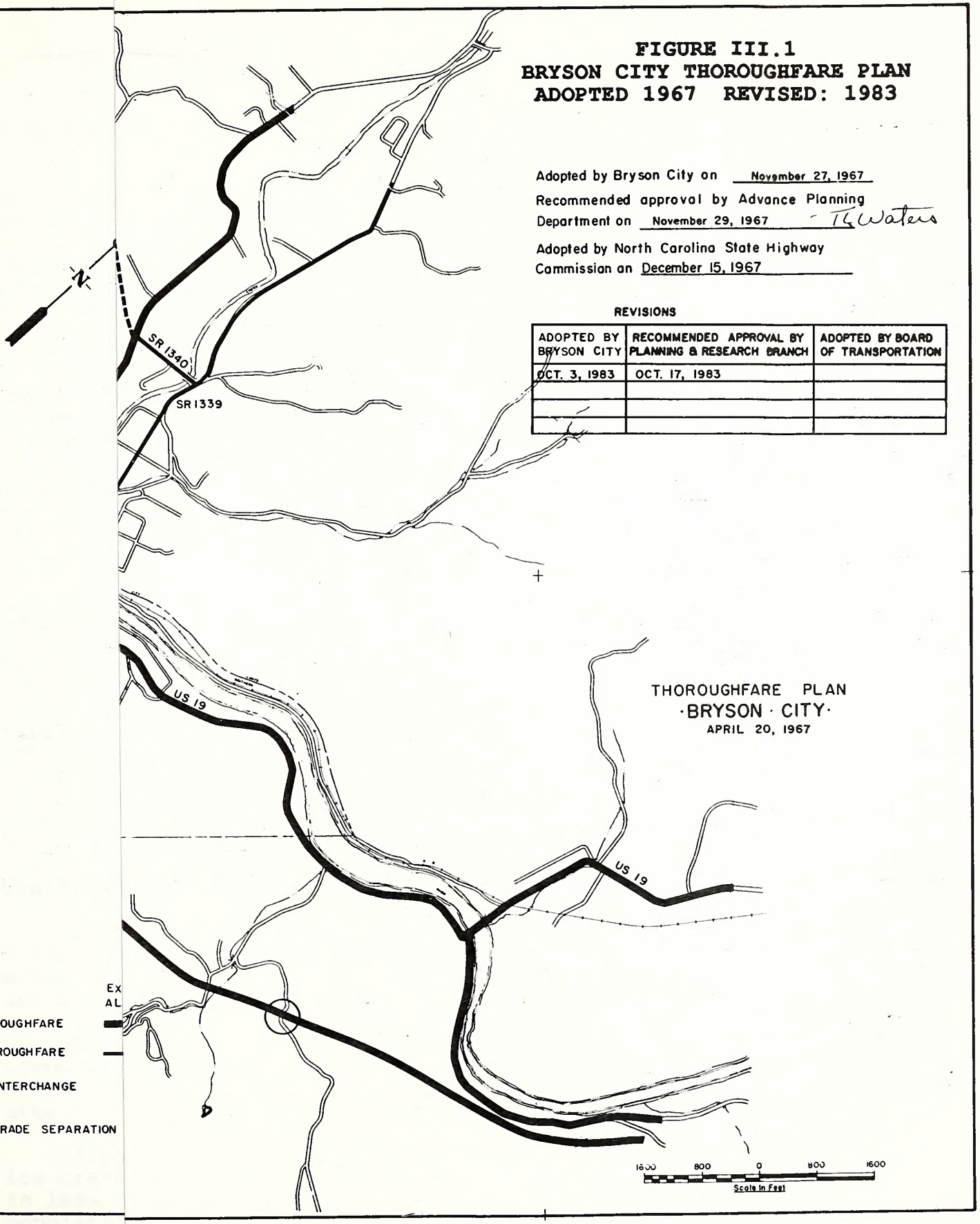
Adopted by Bryson City on November 27, 1967

Recommended approval by Advance Planning Department on November 29, 1967 - T.G. Waters

Adopted by North Carolina State Highway Commission on December 15, 1967

REVISIONS

ADOPTED BY BRYSON CITY	RECOMMENDED APPROVAL BY PLANNING & RESEARCH BRANCH	ADOPTED BY BOARD OF TRANSPORTATION
OCT. 3, 1983	OCT. 17, 1983	



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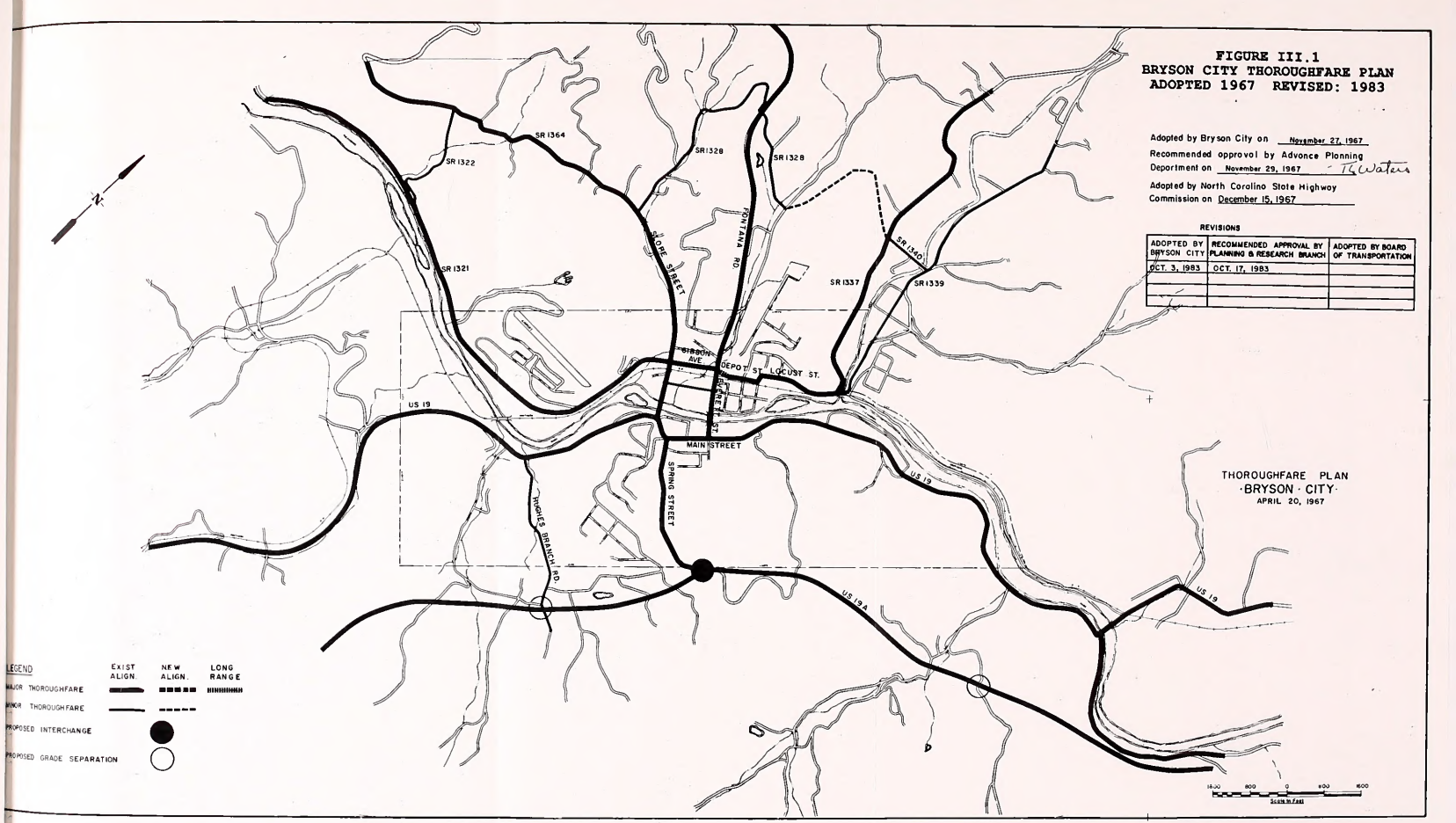
EX
AL

OR THOROUGHFARE

OR THOROUGHFARE

POSED INTERCHANGE

POSED GRADE SEPARATION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REVISIONS
ADOPTED BY BRYSON CITY | RECOMMENDED APPROVAL BY PLANNING & RESEARCH BRANCH | ADOPTED BY BOARD OF TRANSPORTATION
OCT. 3, 1983 | OCT. 17, 1983
SR 1364
SR 1322
SR 1328
SR 1328
SR 1321
SR 1340
SR 1337
SR 1339
MOORE STREET
FONTANA RD
GIBSON AVE
DEPOT ST
LOCUST ST.
US 19
MAIN STREET
SPRING STREET
THORPE BRANCH RD.
US 19
US 19A
US 19
THOROUGHFARE PLAN
·BRYSON · CITY·
APRIL 20, 1967
LEGEND
EXIST. ALIGN.
NEW ALIGN.
LONG RANGE
MAJOR THOROUGHFARE
MINOR THOROUGHFARE
PROPOSED INTERCHANGE
PROPOSED GRADE SEPARATION
1400 800 0 800 1600
Scale in Feet

IV. PAST, PRESENT, AND FUTURE CONDITIONS

Forecasting Travel Demand

In order to assess the effectiveness of the current thoroughfare plan for future conditions, anticipated travel demands must be derived. Traffic flows result from complex interactions among a number of factors, the road system being only one component in this process. The road network determines where travel can take place. How much travel actually occurs depends on land use, demographics, and economic conditions.

Road location and capacity are constrained by such factors as topography, available funds, and planning or design decisions. Forecasts of traffic volumes imply accurate predictions of the growth and distribution of population and employment. Specific considerations include household size, employment type, average income, fuel costs, and vehicle ownership and occupancy rates. Analysis of historic trends provides a useful perspective for predicting future conditions.

Some factors, such as potential locations for commercial development, are specific to the local area under study. Others, such as fuel costs, are more general. These reflect national (or even global) social, political, and economic trends, which must be considered in the context of local conditions. Obviously, the nature of these forecasts involves some uncertainty, and the results are much more sensitive to some factors than others. But by analyzing a range of reasonable values for the most critical variables, it is possible to identify a useful set of most likely outcomes.

Traffic Growth Indicators

Figures IV.1 and IV.2 depict changes in average daily traffic on representative thoroughfares in the Bryson City study area. Although there is variation from year to year, and from facility to facility (with major routes exhibiting the highest growth rates), traffic has been growing at an overall rate of 3.4% per year since 1980. Comparing this trend to those of other growth indicators provides some useful insight for traffic forecasting in the Bryson City area.

Although the population of an area obviously influences its travel characteristics, in Bryson City this relationship is less direct than is typical. Even while Swain County's population was shrinking, growth in tourism was causing significant increases in traffic. Many vacationers use

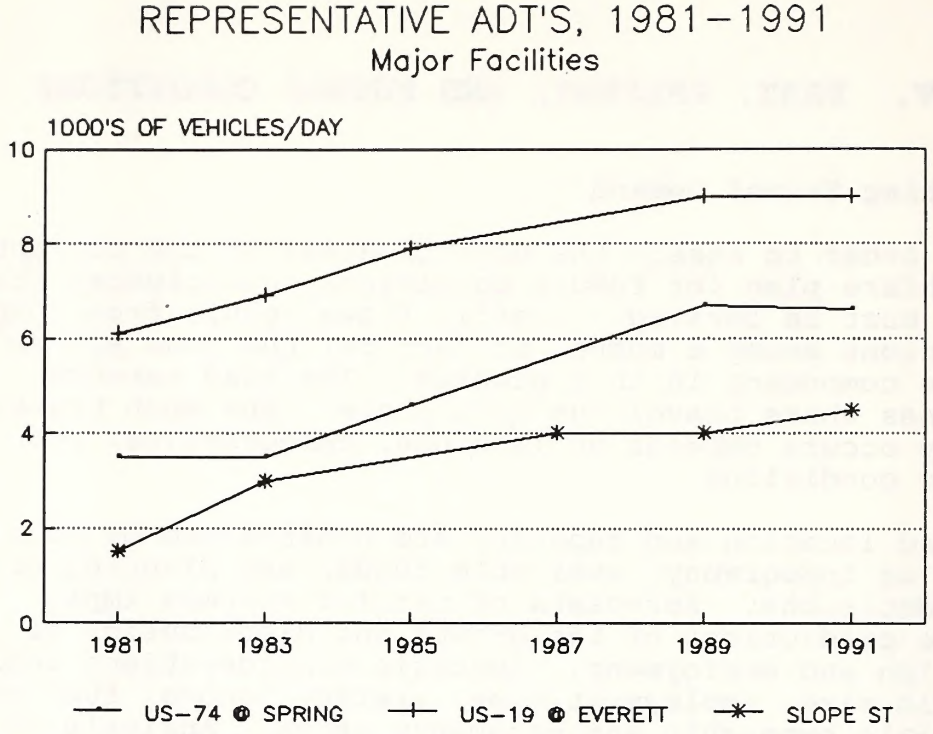


FIGURE IV.1

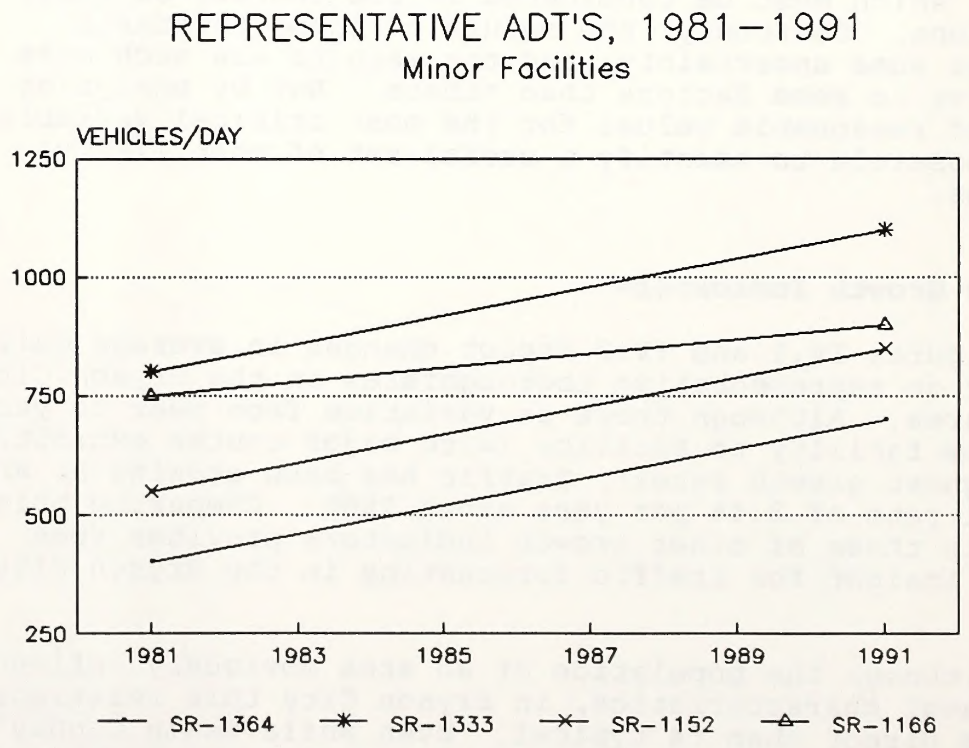


FIGURE IV.2

Bryson City as a convenient "base of operations," effectively functioning as short-term residents who make frequent trips to nearby attractions and retailers. Figure IV.3 emphasizes another indication of the regions growing attractiveness for recreation and retirement. Although the total number of housing units in Swain County increased from 4,853 in 1980 to 5,664 in 1990, 87% of the new units were seasonal housing. Seasonal residents do not show up in population figures, but can have dramatic impacts on traffic, as will be explained later. Bryson City is also Swain's county seat and its center of commerce and population. This attracts more trips from outlying rural areas than might otherwise be expected.

Employment and vehicle registration are also indicators of travel activity. Figure IV.4 compares recent trends in employment, vehicle registration, and population. It is apparent that vehicle registration has been increasing at a much faster rate than population.

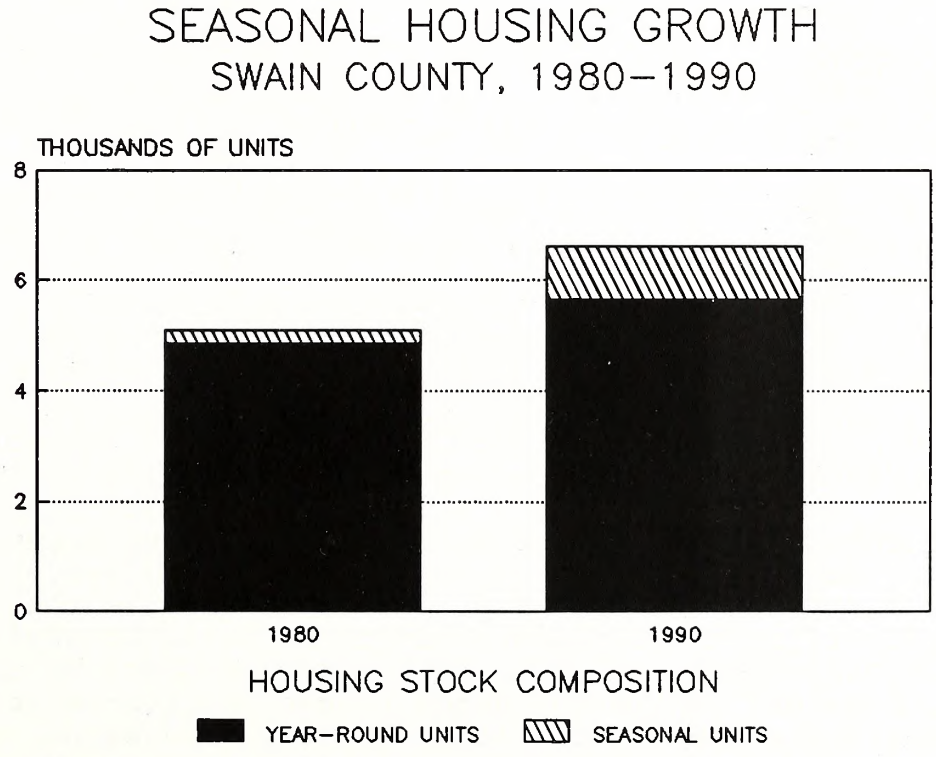


FIGURE IV.3

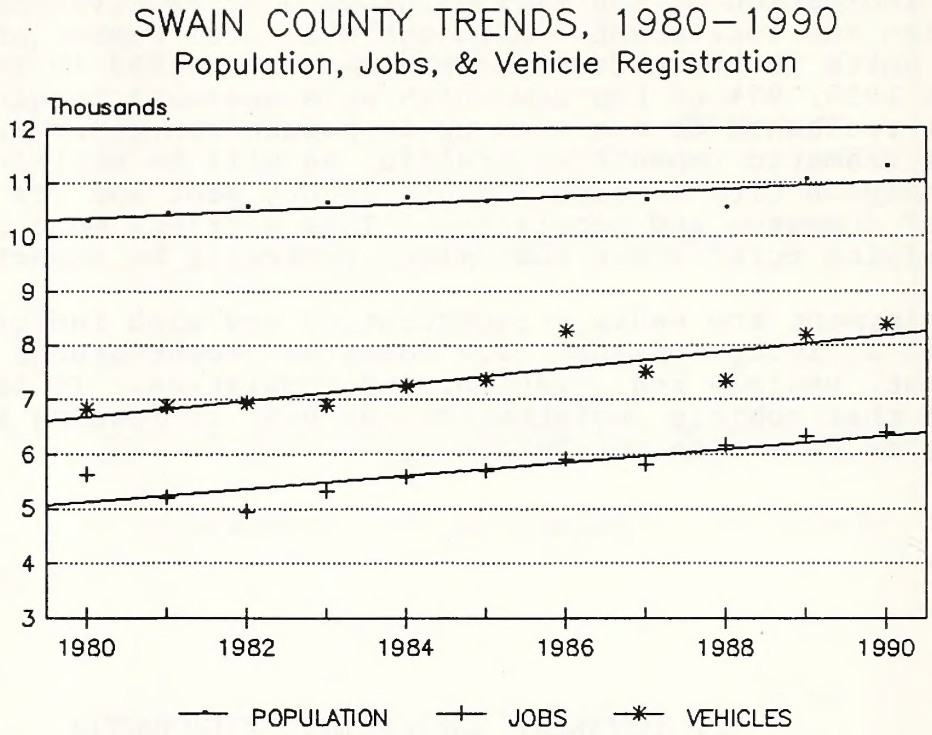


FIGURE IV.4

Figure IV.5 compares Swain County's overall rate of traffic growth with corresponding growth rates for population, employment, retail sales, and vehicle registration. Growth in traffic greatly exceeded growth in the other categories. This is consistent with widely-confirmed national trends. Figure IV.6 emphasizes the growing significance of transportation in Swain County's economy. The paradox of this significance may not be so obvious, however. While increased transportation-related retail sales may benefit the local economy, increased transportation costs can burden individual family budgets.

SWAIN COUNTY GROWTH INDICATORS
1990–91 Relative to 1980–81

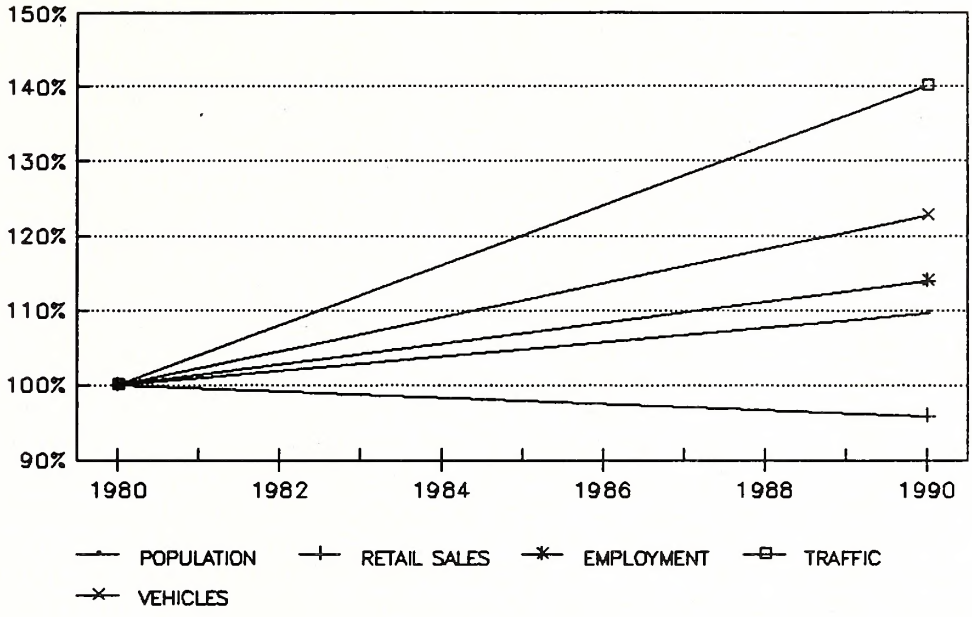


FIGURE IV.5

INCREASE IN TRANSPORTATION COMPONENT
OF SWAIN COUNTY RETAIL SALES

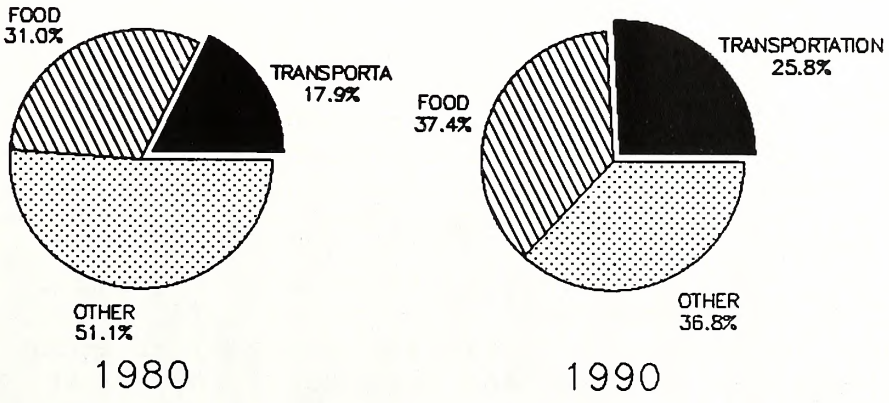


FIGURE IV.6

Land Use

The region's mountainous terrain has influenced land use in various ways. The scarcity of developable land has encouraged the concentration of different activities in a few locations. Within 1000 feet of the riverside park at the center of Bryson City are: government and professional offices; numerous shops and restaurants; motels; houses and apartments; gas stations; churches; schools; light industry (fabricating, assembly, warehousing, and distribution); a courthouse and jail; a scrapyard; a rail depot; a car dealership; and a library. This mixture of land uses can provide a certain vitality, and has the potential to reduce average trip lengths. It also can cause severe congestion problems unless carefully planned, particularly when large trucks and a constrained system of roads and bridges are involved.

Future development is likely to occur west of town along US 19, due to favorable water and sewer conditions, reasonable accessibility, and topographic advantages. There is also some potential for redevelopment and infill in the central part of town. Significant portions of the land north of the Tuckasegee River are either inappropriately or inadequately utilized. Redevelopment in this area could take advantage of the Great Smoky Mountain Railway, enhancements to the riverfront, and the proposed expansion of National Park camping and recreation facilities to the northwest.

US 74 has had little impact on land use adjacent to its interchanges in the Bryson City area. Rugged terrain severely limits the potential of these sites for commercial development. These conditions have helped counteract the tendency in a small town for a bypass to attract retail business activity away from the CBD. In this case, the bypass has probably benefitted the CBD by reducing congestion from through traffic and trucks.

Seasonal Variations

Annual average daily traffic (AADT or ADT) is the most commonly used measure of traffic demand. In some cases, however, the degree of aggregation contained in an annual ADT masks significant monthly or seasonal variations that should be considered in planning and design. Figure IV.7 depicts typical variations in monthly and weekend traffic on a rural arterial in North Carolina. The annual ADT adequately represents the demand for traffic on US-601 in Union County. Figures IV.8 and IV.9 present the same information for two comparable locations in Swain County. Although neither of these stations are in the defined planning area for this study, they do demonstrate the types of seasonal and day-of-week variations in traffic that complicate traffic analysis in Bryson City.

The most striking (but not really surprising) aspect of these graphs is the large variation in monthly ADT's. For US-441, the July ADT is twice the annual ADT, and over seven times the February ADT. These dramatic differences are due to the influence of seasonal weather on recreational travel and residency. The high weekend volumes (over 50% greater than the average weekday) are also explained by recreational travel patterns. This is admittedly an extreme case, due to the overwhelming influence of the Great Smokey Mountains National Park. US-19/74 west of Bryson City, however, is also subject to considerable seasonal peaking. During the five-month period from June through October, the ADT is typically one-third higher than the annual value, and the ADT for the peak month of July is two-thirds higher.

The effects of the recreational peak vary from road to road, depending on the type and itensity of land uses and traffic served. The most serious impacts are in parking shortages and intersection delays near the center of town. The peak-month ADT's are still within the capacities of most of the major arterials (at least in terms of cross-sections), although this will change as volumes increase. Recreational traffic will have less of an impact if local growth starts generating a higher proportion of day-to-day traffic. If seasonal traffic grows at a faster rate than non-seasonal traffic, however, its influence will become even more pronounced.

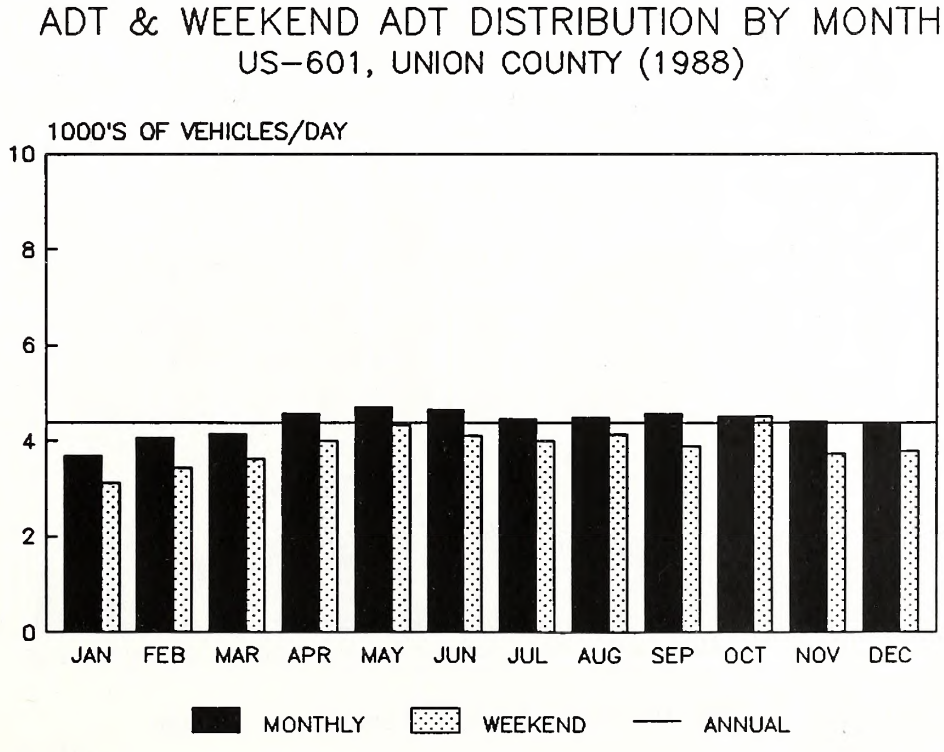


FIGURE IV.7

ADT & WEEKEND ADT DISTRIBUTION BY MONTH
US-19, WEST OF NC-28 (1988)

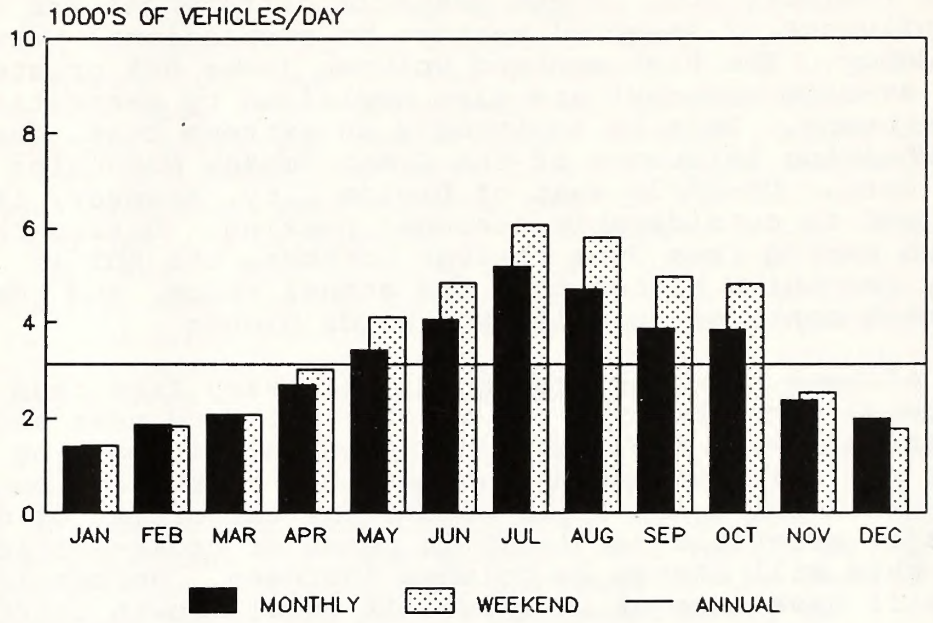


FIGURE IV.8

ADT & WEEKEND ADT DISTRIBUTION BY MONTH
US-441 NEAR SMOKEMONT (1988)

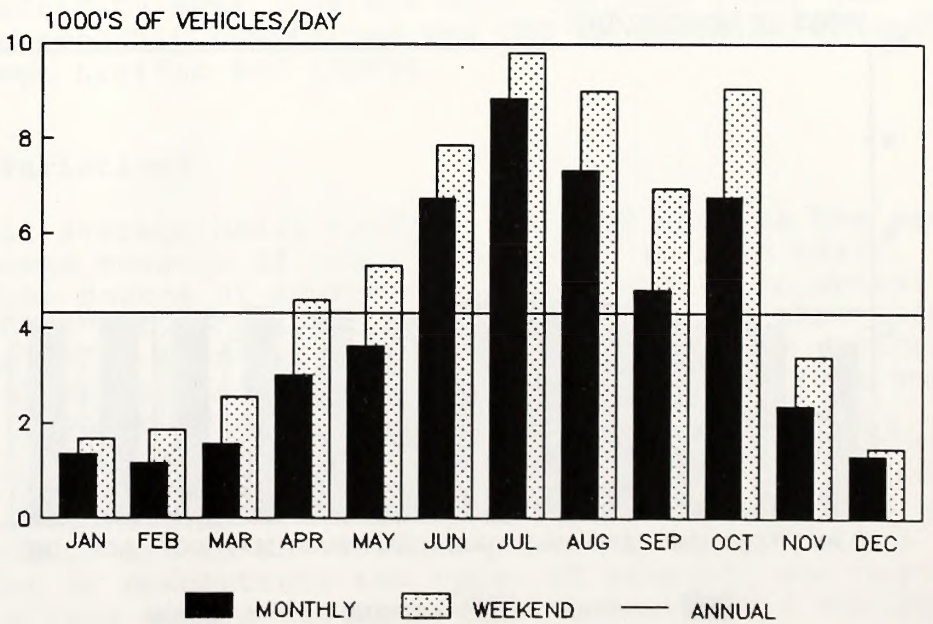


FIGURE IV.9

Truck Traffic

The counts referenced in Figures IV.10 and IV.11 do not suggest a serious problem with truck traffic. The high percentage of single-unit trucks recorded on US-441 is interesting, reflecting a large component of recreational vehicles. Truck volumes alone do not tell the whole story, however. Steep grades and tight turns, especially on two-lane roads, can lead to severe delay and safety problems even when the volume of truck traffic is relatively low. Generally speaking, a truck on level terrain uses up the same capacity as two passenger cars, while that same truck in mountainous terrain can be equivalent to twelve or more cars. A standard recreational vehicle can be equivalent to five or more cars on a steep or winding road.

Trucks are also more of a problem when they are forced to stop and start repeatedly, or if they have to turn tight corners at intersections, especially where there is on-street parking. All of these conditions exist in Bryson City's CBD. Industrial and commercial activities on the north side of the Tuckasegee River funnel truck traffic through town, and the Deep Creek campground attracts numerous recreational vehicles. The proposed National Park campground northwest of Bryson City would add even more recreational traffic.

VEHICLE CLASSIFICATION
PRINCIPAL ARTERIALS, 1987–90

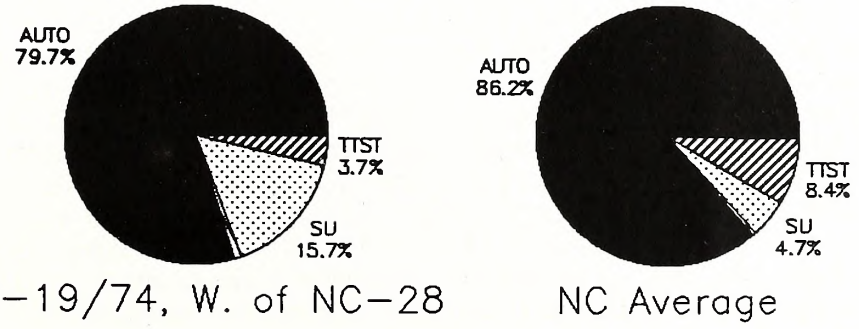
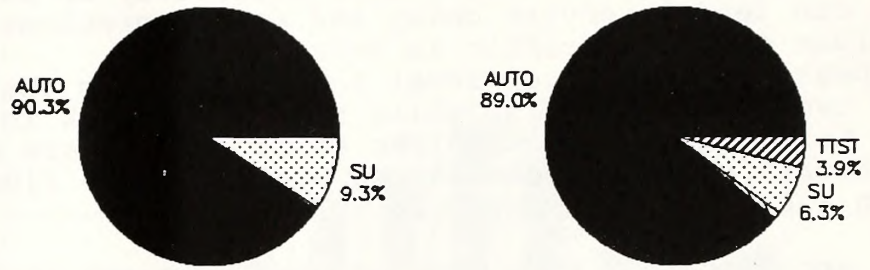


FIGURE IV.10

VEHICLE CLASSIFICATION
MINOR ARTERIALS, 1987–1990



US–441 S. of Smokemont NC Average

FIGURE IV.11

TRAFFIC SAFETY

Historical records of traffic accidents on Bryson City's major thoroughfares confirm the safety benefits of road improvements. Table IV.1 points out the differences in accident rates among different types of facilities, and compares average North Carolina rates to sections of roadways in Bryson City. Figure IV.12 indicates accident locations from 1986 through 1991.

The high accident rate on Fontana Road (SR-1364) can probably be attributed to high-school drivers. Most of the non-freeway facilities in Bryson City, however, share design deficiencies that lead to unnecessary accidents. A large majority of the accidents analyzed resulted from either turning movement conflicts (collisions with vehicles entering, crossing, or leaving the roadway, including parking), or running off the road (narrow lanes and shoulders, sharp turns, roadside obstacles). Frequent, unexpected driveways and intersections are often poorly defined, creating confusion, particulary among drivers unfamiliar with the area. Improper on-street parking further interferes with visibility and traffic flow. Specific safety improvements are discussed in Chapter V.

ACCIDENTS PER 100 MILLION VEHICLE-MILES OF TRAVEL	
BRYSON CITY, 1989-1991	**NC RURAL AVERAGE**, 1991
US-74.....5	47.....US Route, freeway
US-19.....55	166.....US Route, 2-lane
Gibson Street.....70 **Fontana Road.....580** Spring Street.....110	278.....Secondary Road 278.....Secondary Road 278.....Secondary Road

TABLE IV.1

Conclusions

It is safe to assume that recreational travel, seasonal residency, and retiree in-migration will grow at a healthy rate in the Bryson City area, even in the face of recession or higher fuel prices. Although economic conditions may discourage some travellers from making recreation trips to the area, these same conditions would cause many other travellers to substitute such trips for more expensive trips to more distant destinations. Regardless of the economy, Bryson City's location ensures it will be accessible to an increasing number of recreational trips. Many of the fastest growing major metropolitan areas in the Southeast are less than 200 miles away, including: Atlanta, Chattanooga, Charlotte, Knoxville, Columbia, Nashville, Lexington, Huntsville, Macon, and Winston-Salem. Major regional highway improvement projects such as upgrading NC 28, widening US 23/441, and re-aligning US 19/74 will stimulate even more travel to the area. Relatively low land prices should also contribute to Bryson City's attractiveness as a vacation, resort, and retirement center.

Figure IV.13 depicts three different population-growth scenarios for Swain County: High Growth, Medium Growth, and Low Growth. Although the impacts of all three scenarios were considered in this study, the Medium Growth (0.9% annual growth) scenario serves as the basis for the analysis. From the preceding discussion of historical trends and existing conditions, it is obvious that traffic will continue to increase at a faster rate than population or employment. Figure IV.14 reflects this conclusion. It summarizes traffic forecasts for 2005 and 2015 at a number of locations, and compares these volumes with 1991 ADT's.

SWAIN COUNTY
POPULATION PROJECTIONS

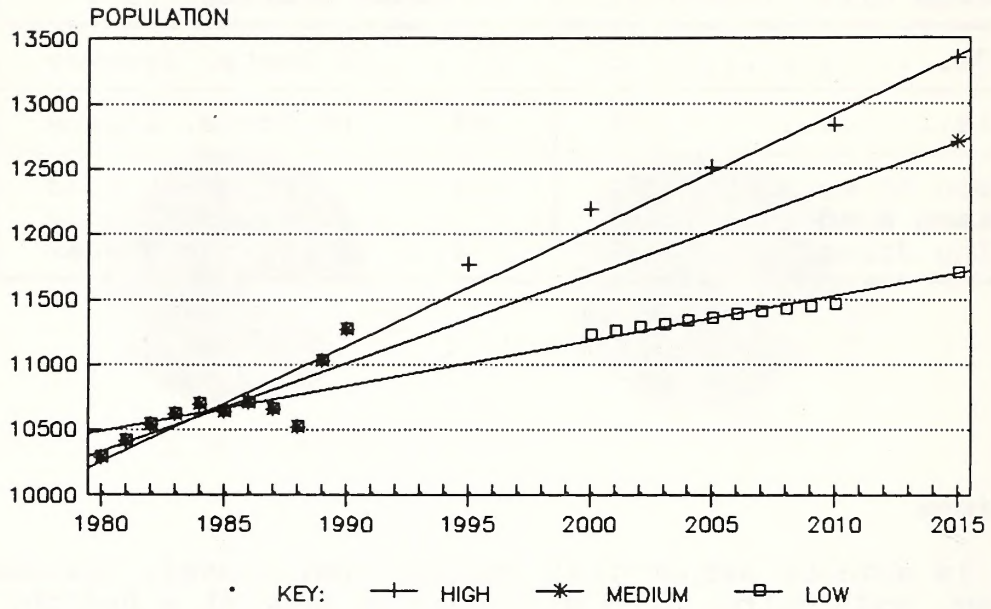
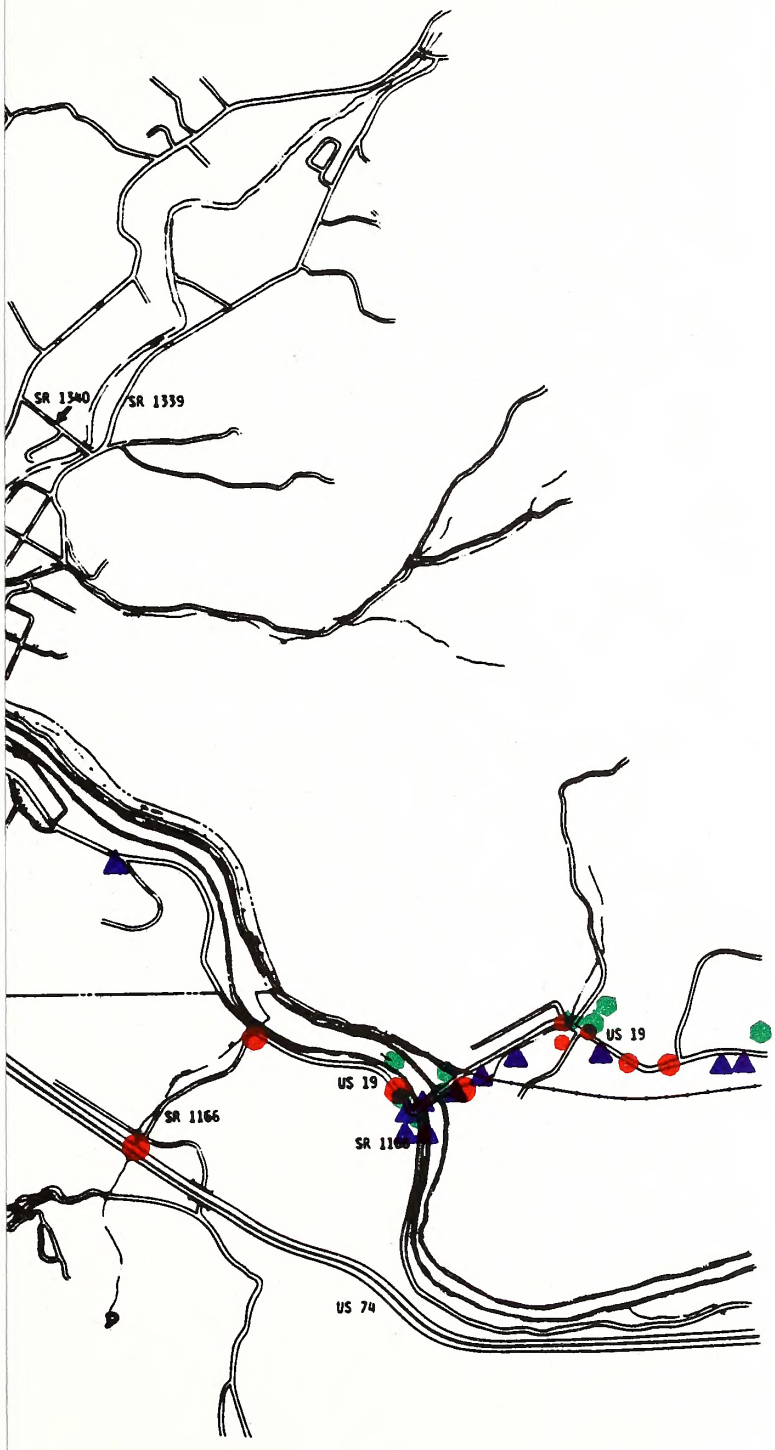


FIGURE IV.13

ANNUAL ACCIDENT LOCATION



1990-1991 —

1988-1989 —

1986-1987 —

FIGURE IV.12

BRYSON CITY

SWAIN COUNTY
POPULATION PROJECTIONS

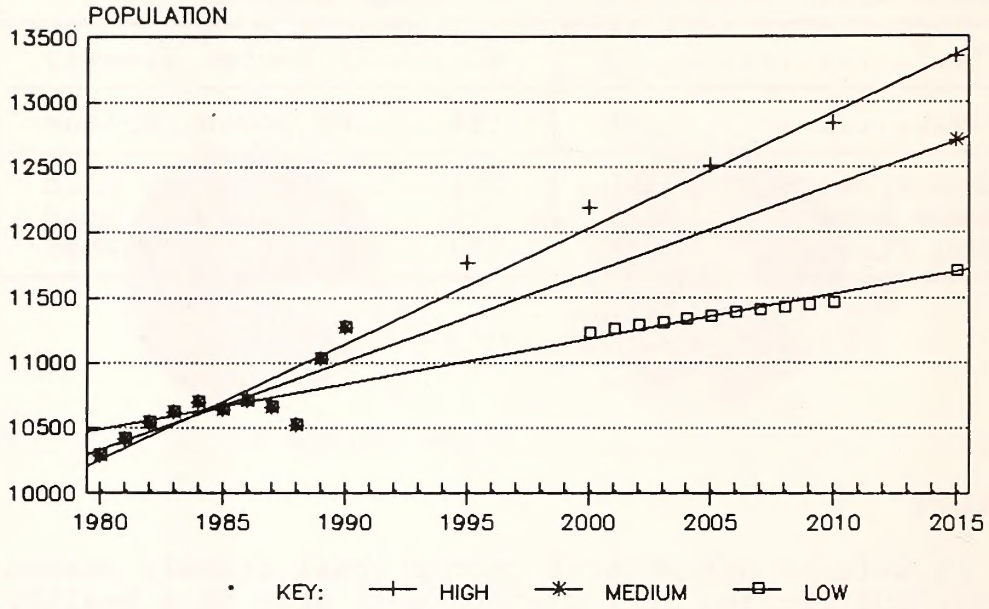
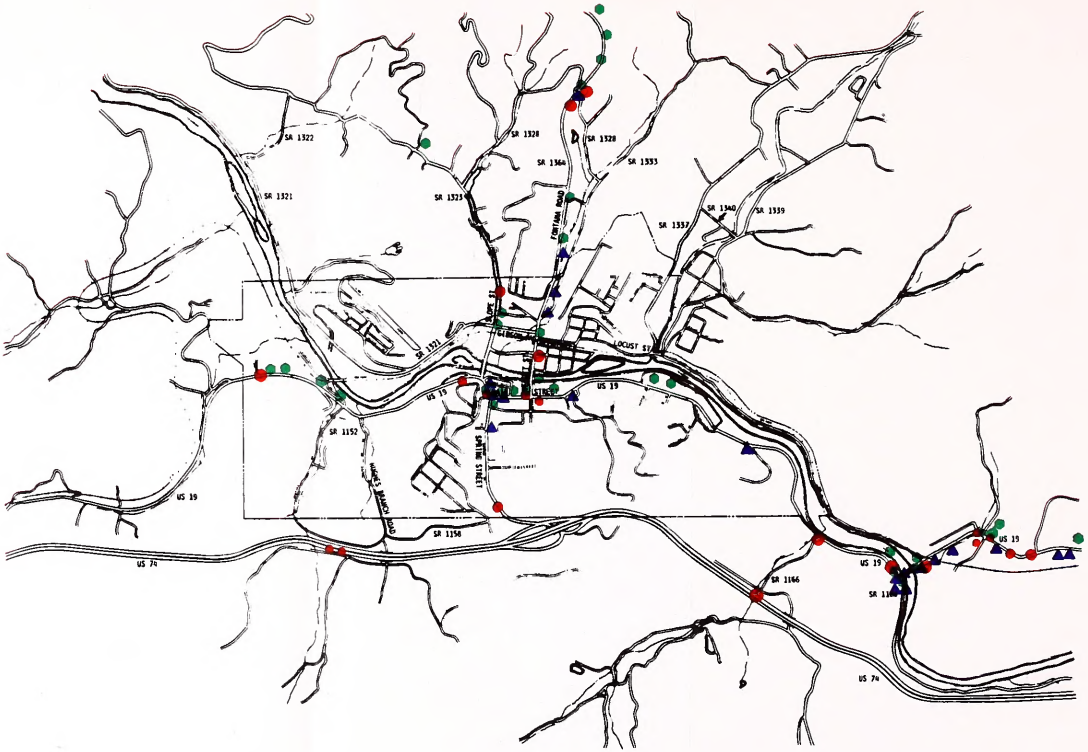


FIGURE IV.13

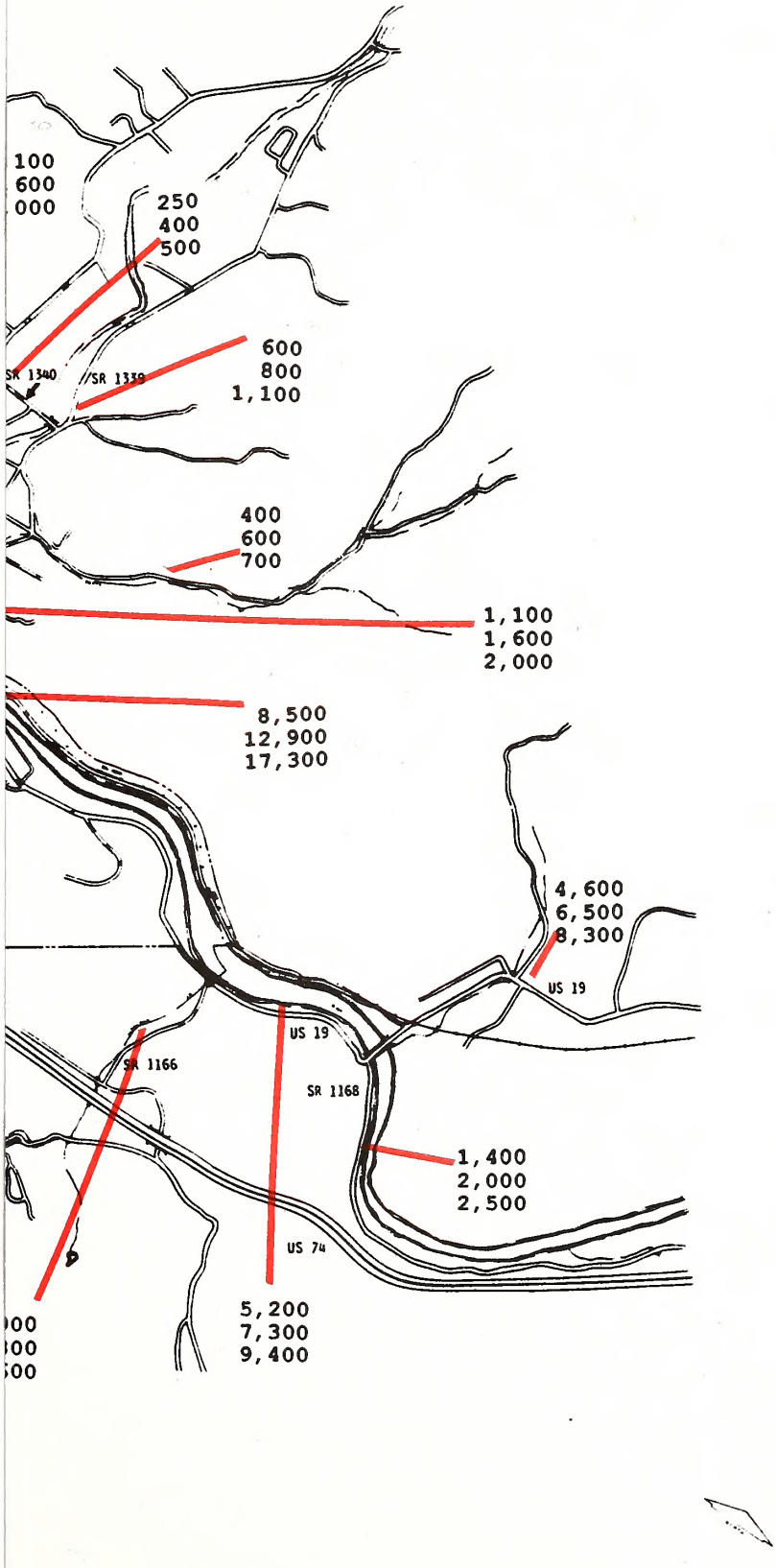


ANNUAL ACCIDENT LOCATION

1990-1991 ●
1988-1989 ●
1986-1987 ▲

FIGURE IV.12

BRYSON CITY

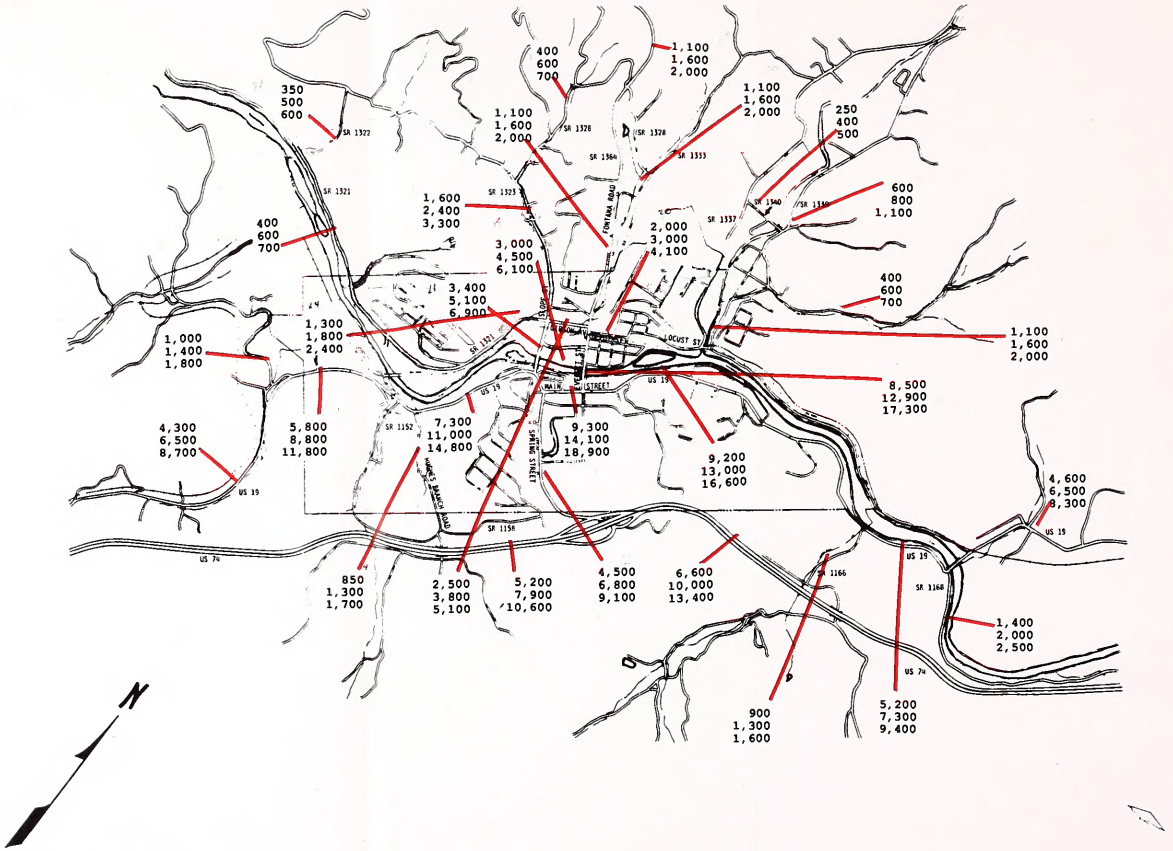


EXISTING AND PROJECTED TRAFFIC VOLUMES

ADT	YEAR
0 0 0 0	1991
0 0 0 0	2005
0 0 0 0	2015

FIGURE IV.14

BRYSON CITY



EXISTING AND PROJECTED TRAFFIC VOLUMES

ADT	YEAR
0 0 0 0	1991
0 0 0 0	2005
0 0 0 0	2015

FIGURE IV.14

BRYSON CITY

V. ALTERNATIVES & RECOMMENDATIONS

Critical Needs

The critical traffic problems in Bryson City fall into four categories. Although presented as separate and distinct, all are symptomatic of deficiencies in the thoroughfare system.

1. Confusing and inefficient traffic flow leads to excessive conflicts in the central business district. This problem is most apparent during peak tourist periods, with the arrival of large numbers of travelers unfamiliar with the area. Patrons of the Great Smokey Mountain Railway, in particular, create congestion and tie up much of the available parking. Numerous pedestrian conflicts occur as people walk from parked cars to the depot.

2. Undesirable design and operating conditions exist which may not lead to accidents at low volumes, but which become unacceptable hazards as traffic increases.

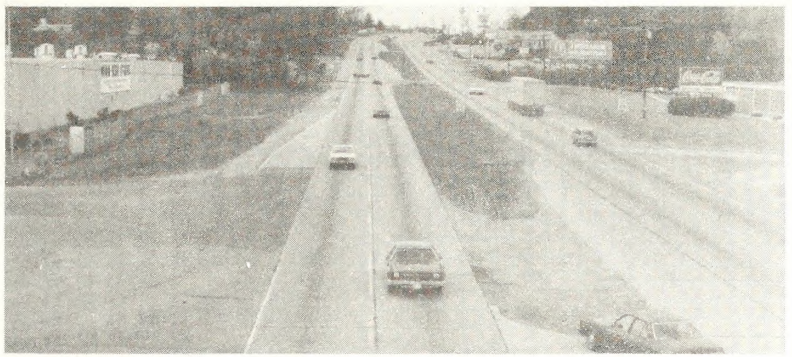
3. There is inadequate access to some areas, limiting development potential and increasing both the cost of living and the cost of doing business in Bryson City.

4. Existing US-19 (Main Street) and Everett Street lack sufficient capacity to carry the projected growth in traffic volumes over the next 25 years. Most of US-19 between Slope Street and the eastern city limits is already operating at no better than level of service "D" (see Figures V.1 and V.2, and Table V.1). By 2005, Everett Street will be at LOS "D", and the deficiencies on US-19 will extend from Hughes Branch Road to SR-1168. All of US-19 will be inadequate by 2015.

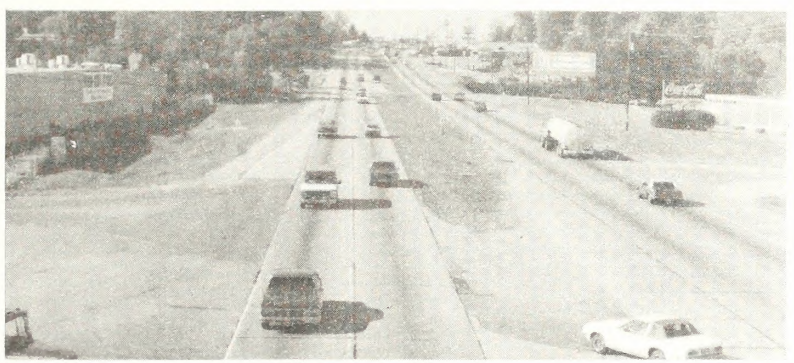
Evaluation of Alternatives

There are a number of possible solutions to the types of problems described above. Some of the solutions address a single problem, others have broader benefits. Some require new construction, some are operational in nature.

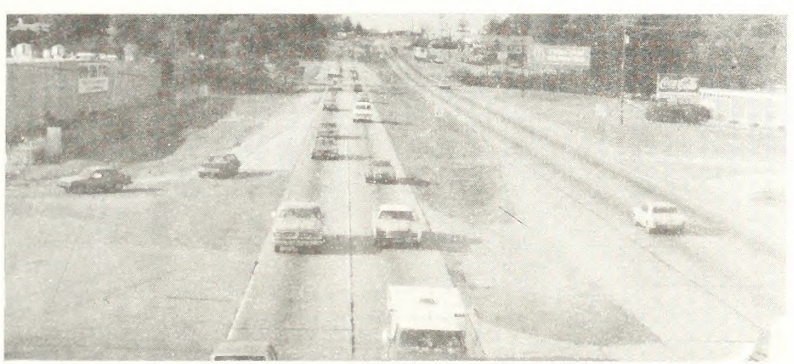
The **Bryson City Traffic Study**, conducted in 1989 through NCDOT's Municipal Traffic Engineering Assistance Program, analyzes parking and circulation problems and recommends an exhaustive list of specific design and operational improvements. These recommendations are consistent with the needs identified in the Thoroughfare Plan Study, and address such issues as:



LEVEL OF SERVICE - A



LEVEL OF SERVICE - B



LEVEL OF SERVICE - C

LEVEL OF SERVICE - D

LEVEL OF SERVICE - E

LEVEL OF SERVICE - F

LEVELS OF SERVICE

TABLE V.I

LEVELS OF SERVICE

1. Level of Service A - A condition of free flow with low traffic volumes and high speeds. Traffic density is low, with speeds controlled by driver desires, speed limits, and physical roadway conditions. There is little or no restriction in maneuverability due to the presence of other vehicles, and drivers can maintain their desired speeds with little or no delay.

2. Level of Service B - A zone of stable flow, with operating speeds beginning to be restricted somewhat by traffic conditions. Drivers still have reasonable freedom to select their speed and lane of operation. Reductions in speed are not unreasonable, with a low probability of traffic flow being restricted.

3. Level of Service C - A zone of stable flow, but speeds and maneuverability are more closely controlled by higher volumes. Most of the drivers are restricted in their freedom to select their own speed, change lanes, or pass. A relatively satisfactory operating speed is still obtained with service volumes perhaps suitable for urban design practice.

4. Level of Service D - Approaches unstable flow, with tolerable operating speeds being maintained though considerably affected by changes in operating conditions. Fluctuations in volume and temporary restrictions to flow may cause substantial drops in operating speeds. Drivers have little freedom to maneuver, and comfort and convenience are low, but conditions can be tolerated for short periods of time.

5. Level of Service E - Represents operations at even lower operating speeds than in Level D, with volumes at or near the capacity of the highway. At capacity, speeds are typically, but not always in the neighborhood of 30 mph. Flow is unstable, and there may be stoppages of momentary duration.

6. Level of Service F - Forced flow operations at low speeds, where volumes are below capacity. These conditions usually result from lines of vehicles backing up from a restriction downstream. The section under study will be serving as a storage area during parts or all of the peak hour. Speeds are reduced substantially and stoppages may occur for short or long periods of time because of downsteam congestion. In the extreme, both speed and volume can drop to zero.

1. Parking management
2. Physical and operational improvements
3. Driveway regulations
4. Traffic control and signing
5. Alleyway system and parking lot circulation
6. Pedestrian improvements

Figure V.3 depicts a re-alignment of Depot Street proposed in the **Bryson City Traffic Study.** This is a more ambitious solution than the minor shift at Everett Street indicated in the existing thoroughfare plan. A straight link between Deep Creek Road to Gibson Street not only improves traffic flow, it also frees up land adjacent to the railroad depot, enhancing pedestrian safety and creating opportunities for development associated with the railroad. Portions of Bryson and Ramseur Streets have been added to the plan, providing an alternative route around the depot, especially during train stops.

Other safety-related network improvements recommended in the **Bryson City Traffic Study** are eliminating the western intersection of Carringer Street and US-19, and recon-structing the intersection of SR-1366 and Fontana Road.

The current thoroughfare plan recommends connecting SR-1328 and SR-1340. Steep terrain makes this a difficult and expensive project, not warranted by current or projected traffic volumes. Improvements to SR-1333 and SR-1337 should provide acceptable service at reasonable cost.

Little benefit can be gained by constructing new or wider thoroughfares in the central part of Bryson City. Widening critical congested links would conflict with existing structures on at least one side of the road. Commercial establishments along Everett and Main Streets are the most obvious example of this obstacle. Any major new facility would consume a significant portion of the limited land available for development.

One-way street pairs are often suggested as solutions to circulation and parking problems in small towns. They are not appropriate for Bryson City, at least in terms of major movements on thoroughfares. There are no dominant traffic flows served by pairs of closely-spaced parallel streets. Instead, there is an interweaving of different movements, and a highly constrained road network. A one-way street system in Bryson City would operate like a large traffic circle made up of Main, Everest, Gibson, and Slope Streets. Traffic would be routed through additional intersections, increasing travel distances and creating unnecessary confusion and conflicts. As will be discussed later, one-way operation may be a component of a system of alleys and local streets that improves traffic flow on major streets by reducing conflicts and providing alternative on-street parking.

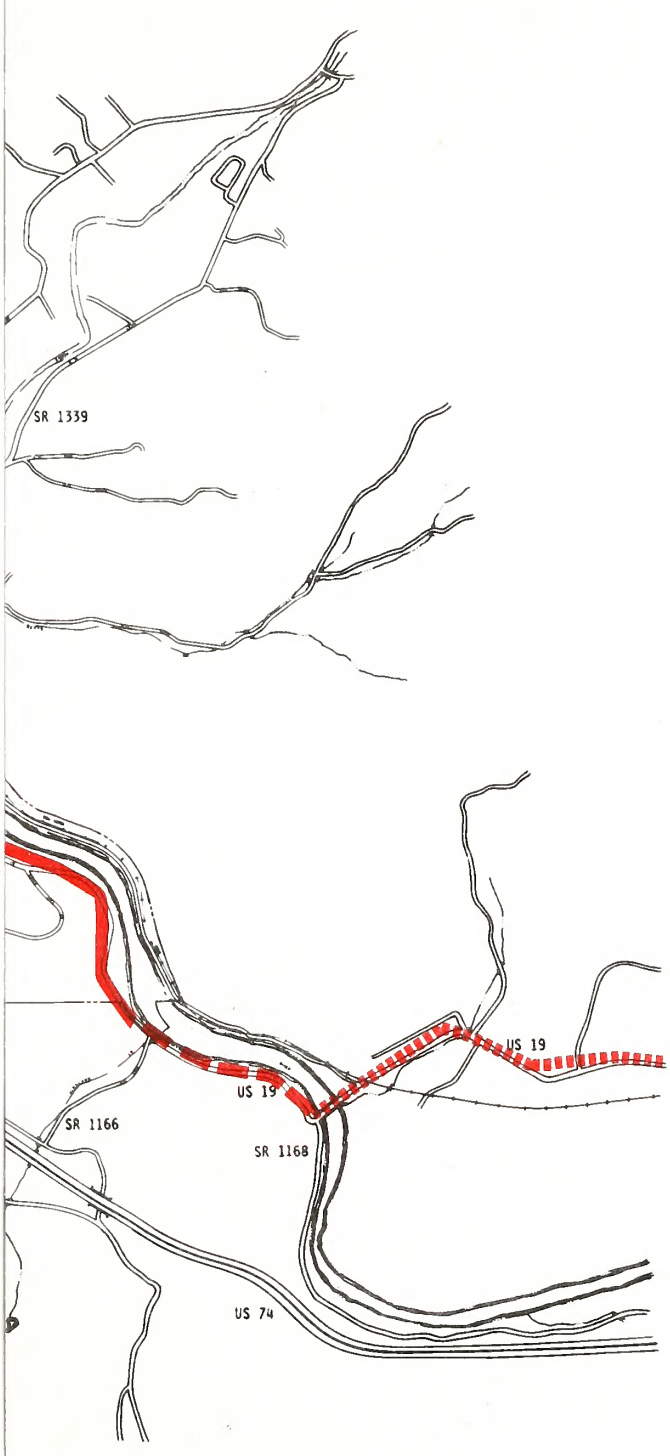


FIGURE V.2

CAPACITY DEFICIENCIES

LEVEL OF SERVICE "D" or WORSE

- 1991
- 2005
- 2015

BRYSON CITY

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2. Physical and operational improvements
3. Driveway regulations
4. Traffic control and signing
5. Alleyway system and parking lot circulation
6. Pedestrian improvements

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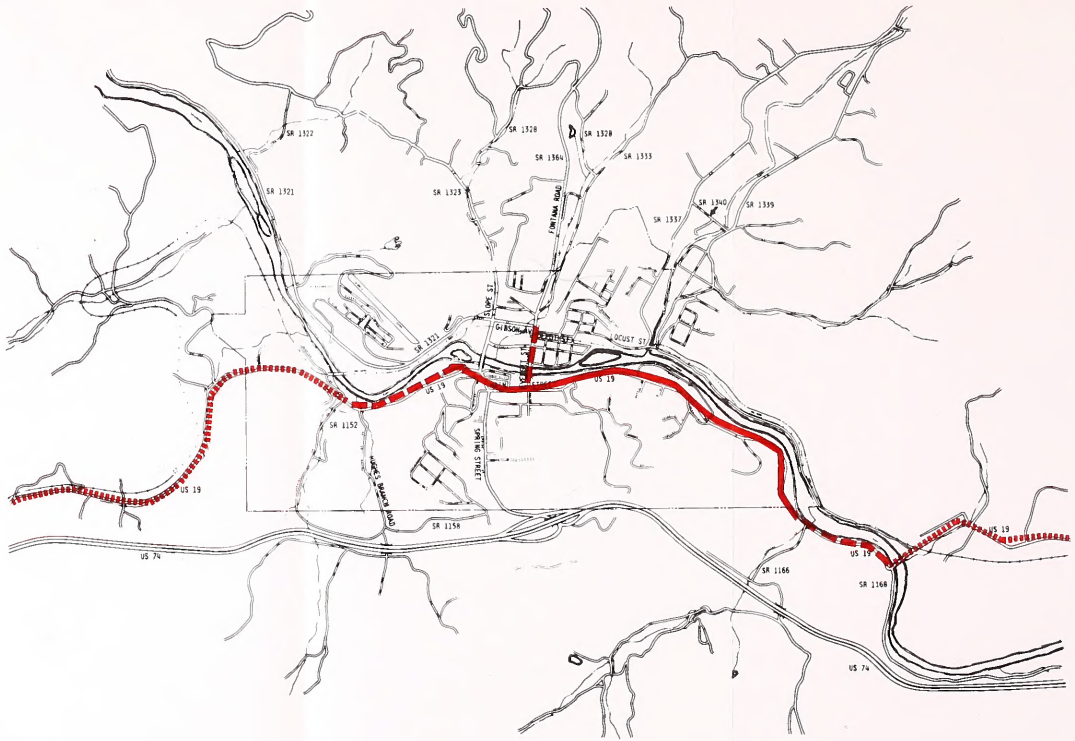


FIGURE V.2

CAPACITY DEFICIENCIES

LEVEL OF SERVICE "D" or WORSE

- 1991
- 2005
- 2015

BRYSON CITY

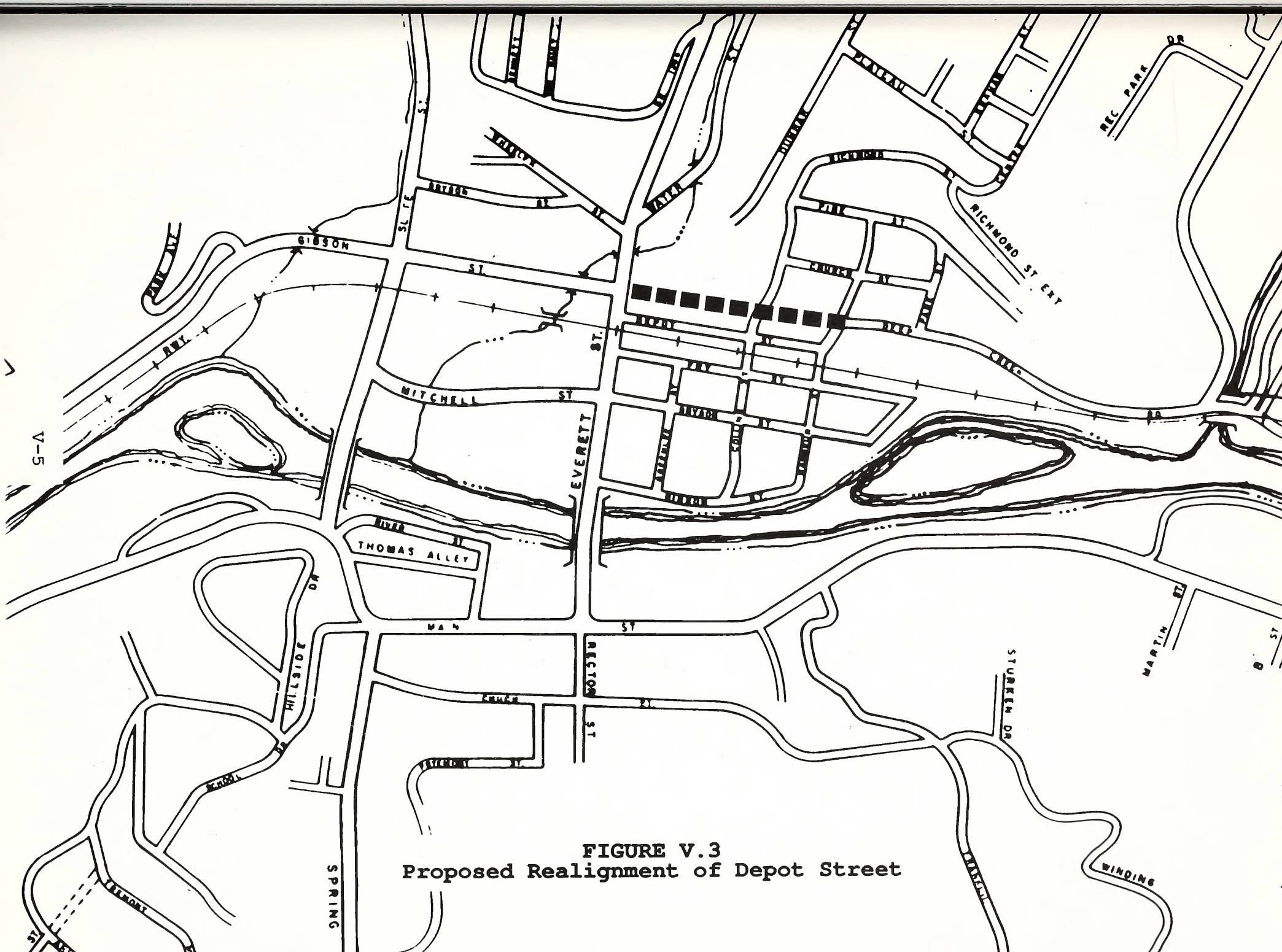


FIGURE V.3
Proposed Realignment of Depot Street

Since the earliest planning for US-74, the practicality of interchanges with both SR-1166 and SR-1155 has been discussed. It is understandable that someone living near one of these existing overpasses might feel frustration at having to drive two miles to get onto US-74. However, a 1988 feasibilty study found that an interchange at SR-1166 could not be justified due to high cost ($4,000,000) and spacing problems with existing interchanges. Although the potential benefits of an interchange at SR-1155 could be greater, the cost and spacing problems are also greater.

An alternative analyzed in the 1988 interchange feasibility study consists of improving and extending SR-1160 to tie into Spring Street, just south of the existing US-74 interchange (Figure V.4). The estimated cost of this alternative was $1,200,000, and the resulting benefits were not adequate to justify the project. Benefits increase, however, if the connector serves development requiring good access and exposure to US-74. An efficient facility may also help relieve congestion on US-19 through Bryson City, but the topography in the corridor makes both of these objectives difficult to attain. A similar project to the west, connecting SR-1158 with Spring Street, appears more feasible, and may warrant further study (see Figure V.5).

There are limited options for increasing the safety and capacity of US-19. Continuous widening beyond three lanes would be difficult. Steep slopes and existing structures interfere with the addition of lanes in many locations. A twisting alignment and hazardous driveway/intersection locations limit passing opportunities and reduce capacity.

For approximately 1.5 miles between SR-1339 and US-19, SR-1336 is an unpaved road with a relatively smooth alignment. Although it may appear an attractive alternative to US-19, potential improvements are severely constrained by adjacent railroad tracks (including three sharply skewed crossings), the Tuckasegee River to the south, and steep slopes to the north. There is virtually no developable land adjacent to this facility, and upgrading to arterial standards would be difficult. This facility has been identified as a desirable bicycle route, since it allows riders to avoid some hazardous sections of US-19.

Another possibility for relieving US-19 east of Bryson City is shown in Figure V.6. Improving and extending SR-1343 and SR-1350 improves access to northern Bryson City, and reduces congestion on US-19 and Everett Street. Drawbacks include high construction costs, the diversion of potential customers from existing businesses, and environmental impacts. Unless associated with major new development, it is not a cost-effective solution. This option could be considered a long-range element in the plan, however.

Alternatives for increasing the capacity of Everett Street are also limited. Existing structures make widening unattractive. Capacity could be increased without major construction, however. Directional signing could be modified, diverting traffic to take advantage of Slope Street's under-utilized capacity. Parking restrictions and intersection improvements would increase the capacity and safety of Everett Street. A three-lane section could be implemented if parking were eliminated on at least one side of the street.

Recommendations

The most severe congestion-related problems in Bryson City are episodic, occurring during peak tourist periods. Unfortunately, most of the impacts of major construction projects are permanent, and costly. Existing land use is disrupted, and developable land is consumed. Environmental and aesthetic disruptions also need to be considered. It is difficult to justify a major capacity-expanding project when the capacity is not needed much of the time. New construc-tion can only be recommended if it eliminates severe deficiencies that non-construction alternatives cannot, and non-construction alternatives are often the most appropriate for episodic deficiencies. Non-construction improvements recommended in the **Bryson City Traffic Study** are endorsed by this report.

Figure V.7 depicts the recommended Bryson City Thor-oughfare Plan. Table V.2 lists the major and minor thor- oughfares, identifies implementation priorities, and summarizes cost and benefit estimates. Appendix A details existing and proposed cross-sections and rights-of-way. Specific recommendations related to the plan are:

1. Provide major and minor thoroughfares with travel lanes at least 12 feet wide, with an absolute minimum of 11 feet for minor thoroughfares (see Appendix A). Consider additional paved shoulder width on designated bicycle routes.

2. Conduct a feasibility study of the SR-1158/Spring Street connector (new frontage road), and re-visit the SR-1160 connector. Consider benefits to US-19 and enhanced development potential as well as direct travel savings to affected residents.

3. Convert Everett and Main Streets to 3-lane operation by eliminating parking on at least one side.

4. Widen US-19 to three or four lanes, incorporating minor alignment improvements. Consolidate, eliminate, and upgrade driveways wherever possible.

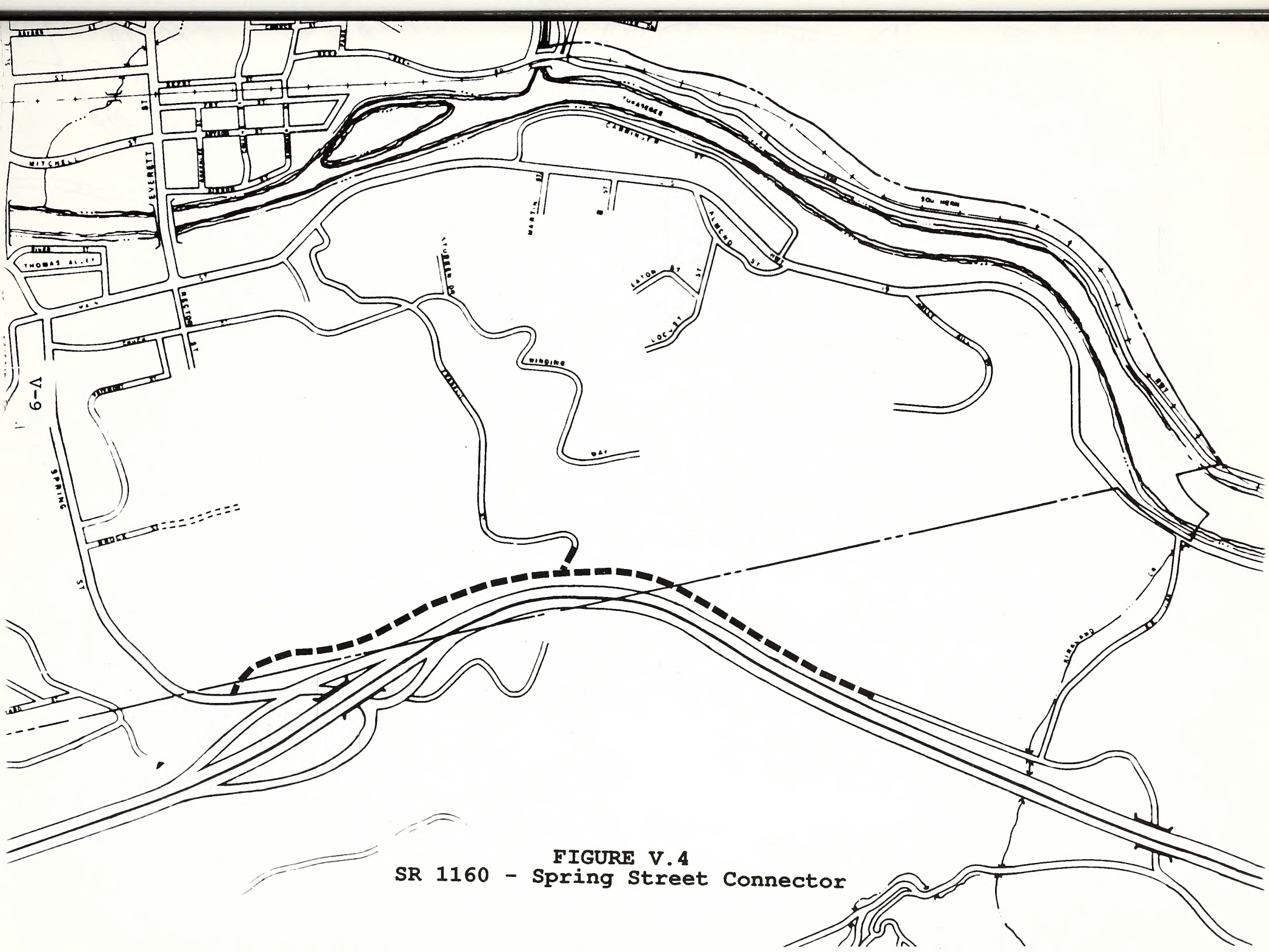


FIGURE V.4
SR 1160 - Spring Street Connector

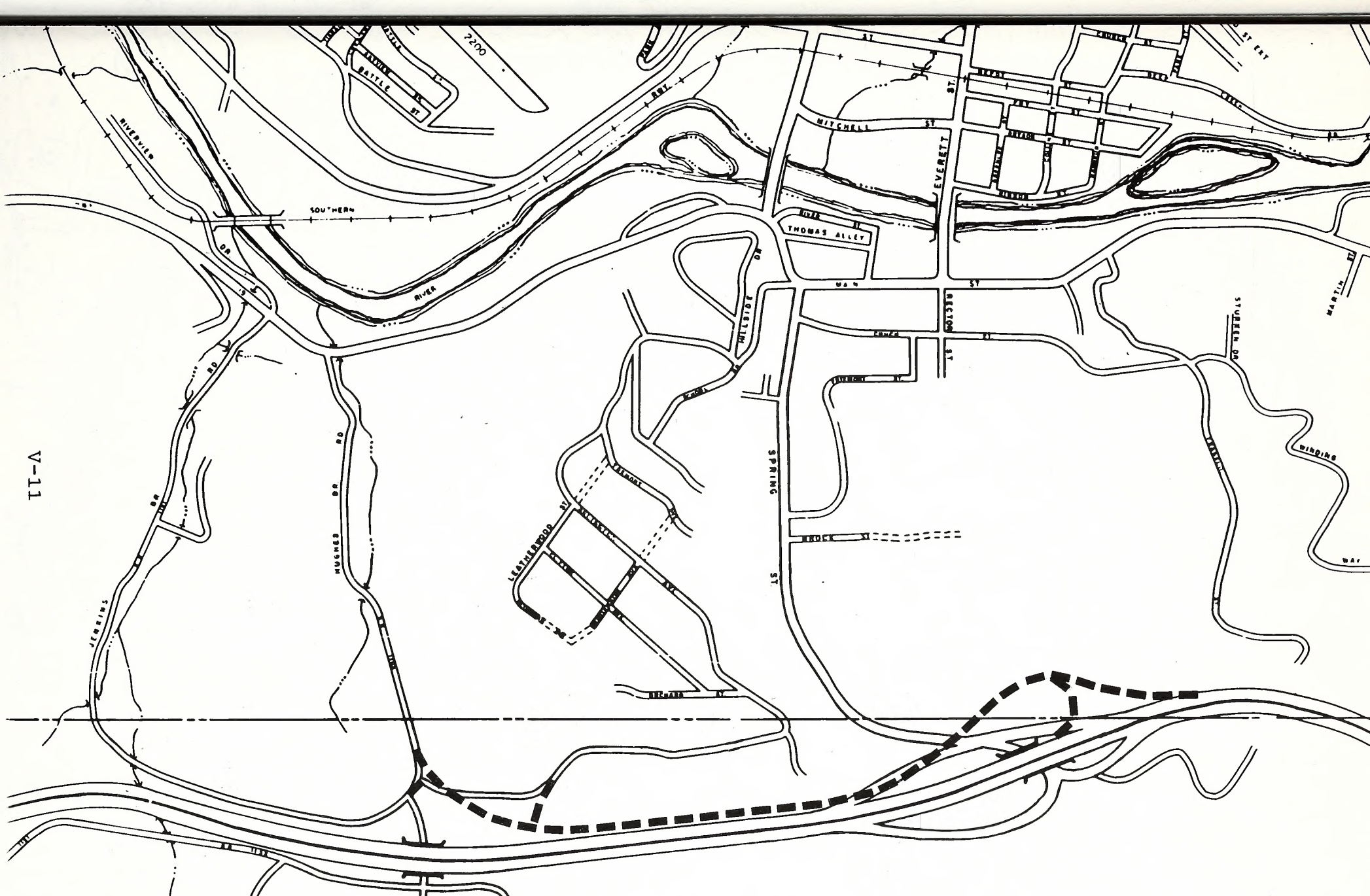


FIGURE V.5
Proposed SR-1158 - Spring St. Connector

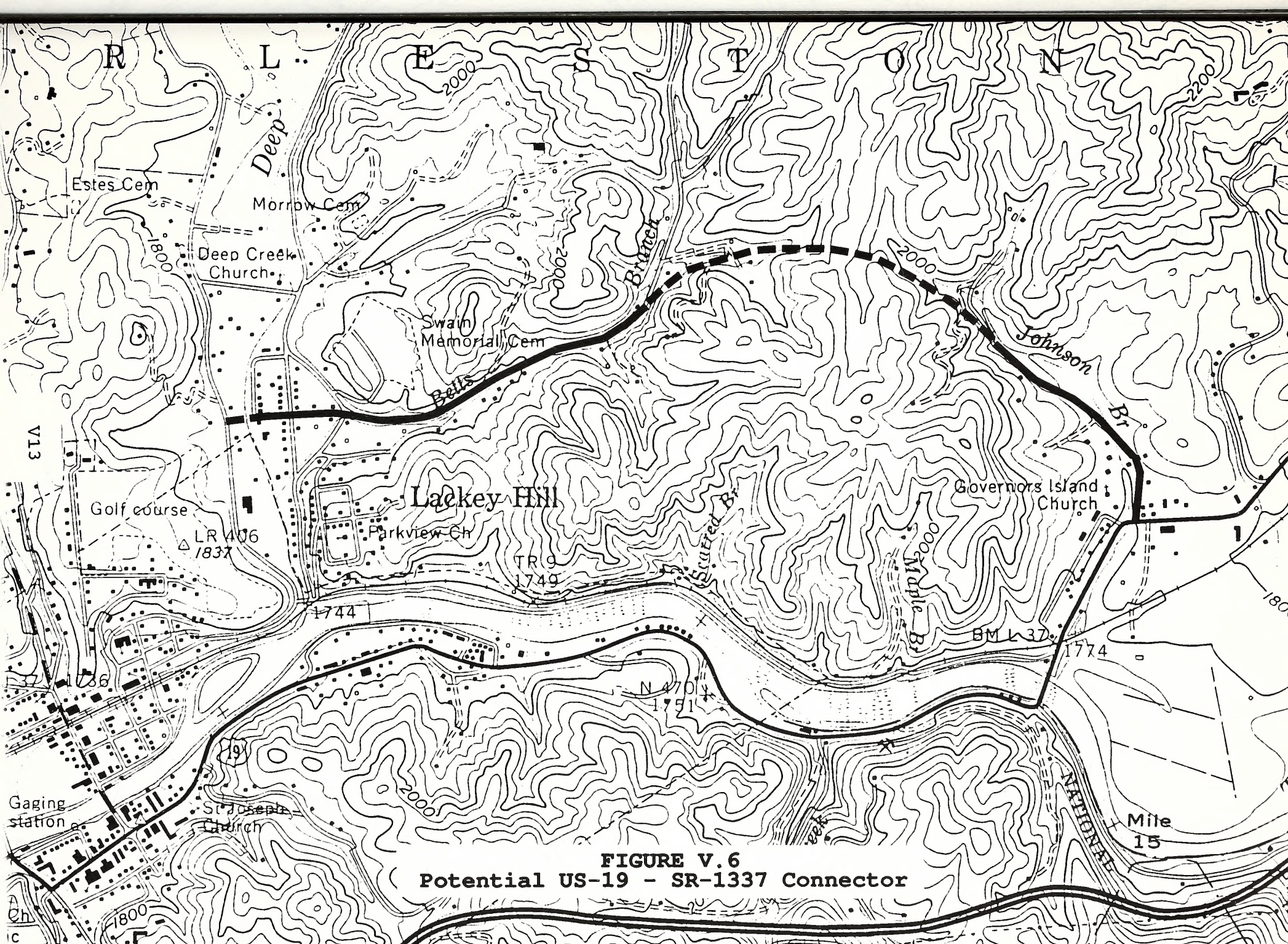


FIGURE V.6
Potential US-19 - SR-1337 Connector

5. Reconstruct Depot Street, creating a straight alignment between Gibson Street and Deep Creek Road.

6. Improve signing and geometry on Bryson and Ramseur Streets, providing an efficient alternative route around the depot.

The upgrading of Bryson and Ramseur Streets could be used to help shape long-term growth in central Bryson City. Mitchell and Bryson Streets form a corridor offering easy access to parking, the county office complex, Island Park, and numerous businesses. An attractive central axis could be created through appropriate redevelopment of adjacent land.

Bryson and Mitchell streets would form the spine of an interconnected grid system of two-lane streets and alleys with parking. This grid defines a number of relatively small blocks. Such an arrangement distributes parking, provides alternative routes for avoiding congestion, promotes pedestrian activity, and allows for effective mixing of land uses. One-way streets and alleys may be effective under these conditions, allowing for narrower roadways that would be consistent in scale with the block and building sizes of the core area.

The compactness of central Bryson City means that almost any two points within it are no more than a ten-minute walk apart. This feature should be exploited by using sidewalks, crosswalks, parking policies, driveway control, and landscaping to encourage walking. Developing greenways and parks along the river is a step in the right direction, increasing the likelihood that people will window-shop and spontaneously drop in at a store or restaurant. Integrating this type of street, alley and sidewalk network with a mixture of adaptive re-use, reconstruction, and infill could help the heart of Bryson City evolve into a dynamic, vibrant combination of retail, commercial, recreational, and residential activities.

TABLE V.2
RECOMMENDED THOROUGHFARES AND IMPROVEMENTS

MAJOR THOROUGHFARES		PROJECT	PRIORITY	COST	BENEFITS
US-74		---	--	--	--
US-19	Slope - Carringer	Widen/Re-stripe	High	> $750	$101,600
US-19	East of Carringer	Add lane(s)	High	$2,390	$125,200
US-19	West of Slope St.	Add lane(s)	Medium	$2,250	$39,800
SR-1364	Everett Street	Re-stripe for 3 lanes	High	< $200	$35,000 Ecn Devlpmt
SR-1323	Spring Street	---	--	--	--
SR-1323	Slope Street	---	--	--	--
SR-1321	Gibson Street	---	--	--	--

KEY:

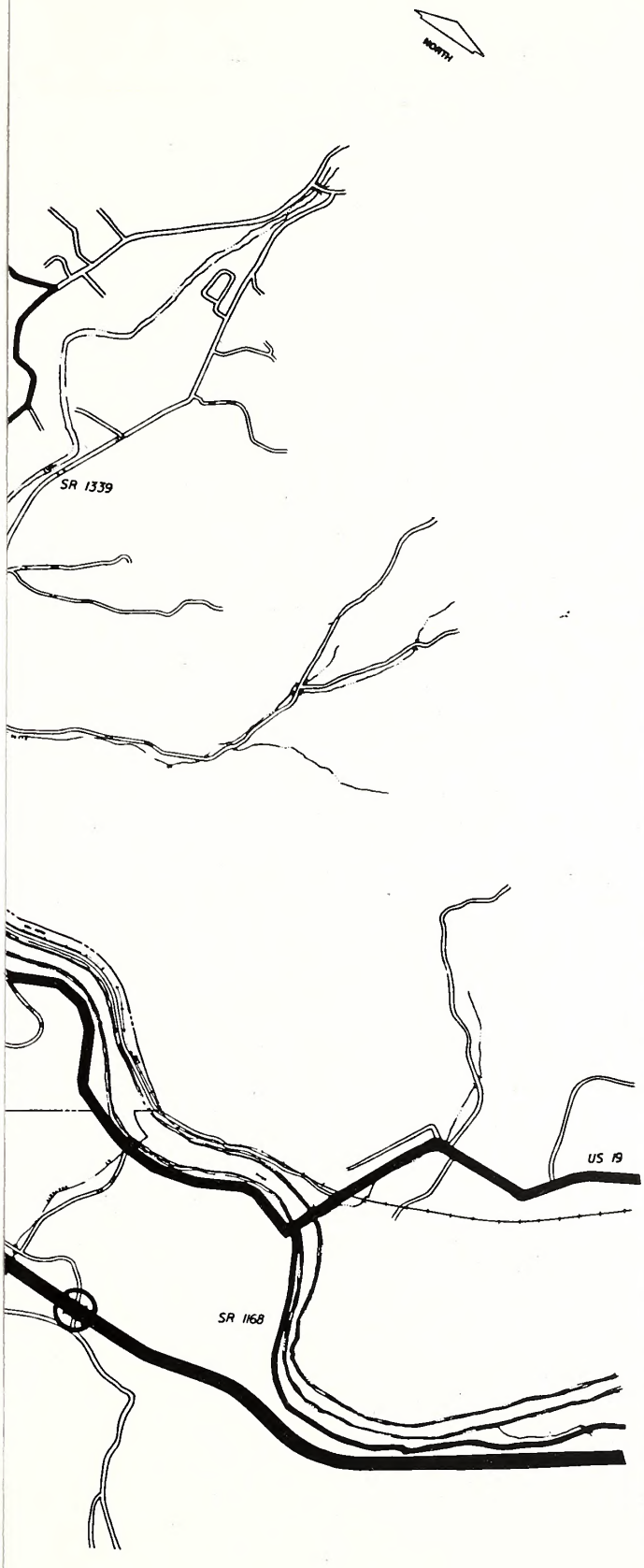
PROJECT - Widen/Improve = widen travel lanes, upgrade shoulders, and improve geometrics where feasible.

COST - Construction cost, in thousands.

BENEFITS - Total time, accident, and operating savings, in thousands.
Safety = accident reductions
Ecn Devlpmt = enhanced economic development opportunities

TABLE V.2
RECOMMENDED THOROUGHFARES AND IMPROVEMENTS

MINOR THOROUGHFARES		PROJECT	PRIORITY	COST	BENEFITS
	Mitchell St.	---	--	--	--
	Bryson St.	Widen/Improve	High	Variable	Safety, Ecn Devlpmt
	Ramseur St.	Widen/Improve	High	Variable	Safety, Ecn Devlpmt
SR-1321	Gibson Street (Slope-Pine)	Widen to 24'	Medium	$350	Safety
SR-1321	Gibson Street (SR 1322-Pine)	Widen/Improve	Low	Variable	Safety
SR-1323	Slope Street (SR 1328-Gibson)	Widen to 24'	Medium	$510	Safety
SR-1323	Slope Street (SR 1322-1328)	Widen/Improve	Low	Variable	Safety
SR-1333	Water Street	Widen/Improve	Medium	Variable	Safety
SR-1336	Depot Street	Relocate	Medium	$250	Safety, Ecn Devlpmt
SR-1336	Locust Street	Widen/Improve	Medium	Variable	Safety
SR-1364	Fontana Road	Widen to 24'	Medium	$830	Safety
SR-1152	Hughes Branch Rd.	Widen to 24'	Low	$450	Safety, Ecn Devlpmt
SR-1168		Widen/Improve	Low	Variable	Safety
SR-1322		Widen/Improve	Low	Variable	Safety
SR-1328		Widen/Improve	Low	Variable	Safety
SR-1337		Widen/Improve	Low	Variable	Safety
SR-1339		Widen/Improve	Low	Variable	Safety
SR-1340		Widen/Improve	Low	Variable	Safety
SR-1366		Widen/Improve	Low	Variable	Safety
	Frontage Rd.	New Facility	Low	$1,500	$4,100 Ecn Devlpmt



BRYSON CITY
THOROUGHFARE PLAN

LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARES		
FREEWAYS	▬▬	▬ ▬
OTHERS	▬▬	▬ ▬
MINOR THOROUGHFARES	▬▬	- - -
INTERCHANGES	●	
GRADE SEPARATIONS	○	

ADOPTED BY:

THE TOWN OF: BRYSON CITY	AUGUST 2, 1993
RECOMMENDED BY: NCDOT STATEWIDE PLANNING BRANCH	AUGUST 6, 1993
NCDOT BOARD OF TRANSPORTATION	OCTOBER 8, 1993

REVISIONS

NUMBER	THE TOWN OF BRYSON CITY	NCDOT STATEWIDE PLANNING BRANCH	NCDOT BOARD OF TRANSPORTATION

BRYSON CITY
NORTH CAROLINA

SWAIN COUNTY

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS - STATEWIDE PLANNING BRANCH
IN COOPERATION WITH
U.S. DEPT. OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

JUNE 22, 1993

FIGURE V.7

FIGURE V.7

BRYSON CITY THOROUGHFARE PLAN

LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARES		
FREEWAYS	▬▬	▬▬
OTHERS	▬	- - - -
MINOR THOROUGHFARES	—	-----
INTERCHANGES	●	
GRADE SEPARATIONS	○	

ADOPTED BY:

THE TOWN OF: BRYSON CITY	AUGUST 2, 1993
RECOMMENDED BY: NCDOT STATEWIDE PLANNING BRANCH	AUGUST 6, 1993
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BRYSON CITY NORTH CAROLINA

SWAIN COUNTY

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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JUNE 22, 1993

VI. ADMINISTRATIVE CONTROLS AND IMPLEMENTATION TOOLS

Implementation is an integral part of the transportation planning process. Neglecting implementation will result in a loss of the capital expended developing a plan. There also will be an opportunity cost associated with those lost expenditures. Most important, the benefits an improved transportation system would have provided will be lost.

Generally, two issues play major roles in the implementation of specific elements of a plan: available finances and citizen involvement. Good planning depends on effective use of the controls and tools described in this chapter to overcome the obstacles of limited funding and negative citizen reaction. A successful implementation policy helps taxpayers obtain maximum value for their money, increasing public confidence in (and approval of) the transportation planning process.

State and Municipal Adoption of the Thoroughfare Plan

Chapter 136, Article 3A, Section 136-66.2 of the General Statutes of North Carolina provides for the adoption of a newly developed or revised thoroughfare plan by the governing body of the municipality and the Department of Transportation, so that the plan can guide future street and highway improvements. The General Statutes also require that, as part of the plan, the governing body of the municipality and Department of Transportation shall reach agreement on responsibilities for existing and proposed streets and highways included in the plan. Facilities designated as the responsibility of the State will be constructed and maintained by the Division of Highways. Facilities identified as the responsibility of the municipality will be constructed and maintained by the municipality.

Following adoption of the mutual plan, the Department of Transportation will initiate negotiations to determine Department and municipal responsibilities. Chapter 136, Article 3A, Section 136-66.1 of the General Statutes provides guidance in the delineation of responsibilities. In summary, these statutes provide that the Department of Transportation shall be responsible for facilities serving significant through traffic and traffic from outside the area to major destinations located inside the municipality. The municipality is responsible for facilities serving primarily internal travel.

Available Controls and Tools

Subdivision Regulations

Subdivision regulations are locally adopted laws governing the establishment of building sites. They allow for the coordination of the otherwise unrelated plans of various

developers. This assures that land development elements such as road right-of-way, parks, school sites, water lines, and sewer outfalls are provided. These regulations also help control the internal design of each new subdivision so that its streets, lots, and other facilities will be safe, pleasant, and economical to maintain.

To yield the greatest benefits, subdivision regulation and administration must be closely coordinated with other local governmental policies and ordinances. The most important of these typically include the Comprehensive Growth Plan, the Utilities Extension Master Plan, and the Thoroughfare Plan. Subdivision regulations can reduce the cost of Thoroughfare Plan implementation by requiring developers to construct portions of major streets, or to dedicate and/or reserve rights-of-way.

Recommended Subdivision Ordinances are included in Appendix B.

Zoning Ordinances

Although zoning ordinances do not directly address the design and construction of streets, they can be valuable tools for thoroughfare planning and implementation. By specifying the allowable locations and intensities of various land uses, zoning regulations improve the accuracy and stability of future land use and traffic projections. Effective zoning ordinances establish development standards that complement traffic operations and minimize strip development.

Official Maps

North Carolina Statutes 136-44.50 through 133-44.53 are collectively designated as the "Roadway Corridor Official Map Act." The legislative body of the community can adopt a Roadway Corridor Official Map (or Official Map) to identify and preserve a proposed road location from encroachment. An Official Map notifies developers that the State or municipality intends to acquire certain properties. By reserving sites for public improvements in anticipation of actual need, an Official Map fosters sound development.

Any project being considered for an Official Map must be included in an adopted street system plan and programed in the State's Transportation Improvement Program (TIP), or be included in a locally adopted capital improvement plan.

NCDOT is limiting its use of Official Maps to large-scale, controlled access facilities in high-growth areas beyond municipal jurisdiction. For projects within municipal jurisdiction, Official Maps should be prepared and adopted by the local government. A municipality may adopt an Official Map extending beyond its extraterritorial jurisdiction with approval from the Board of County Commissioners.

An Official Map temporarily places severe restrictions on private property rights. Subdivision approval and building permit issuance for property lying within an official map alignment can be prohibited for up to three years. The three year reservation period begins at the time the developer requests approval. This authority should be used carefully and only in cases where less restrictive powers are inadequate.

There are two options a municipality may pursue in adopting an Official Map. The first is to consider the Official Map statute as a stand-alone authority to be used as the basis for local adoption of an Official Map. The second is to adopt a local ordinance modelled after the statute, but modified to fit local circumstances and to clarify the statute. Regardless of the approach taken, several procedural steps also must be addressed, such as establishing procedures for considering variance petitions.

An Official Map must be filed with the county Register of Deeds. The map should show the proposed alignment in enough detail to determine its functional design and preliminary right-of-way boundaries. Since the map is intended to show the effect of the proposed project on adjacent properties, existing property boundaries should be identified. As an additional requirement, an environmental impact or preliminary engineering study must begin within one year of the adoption of an Official Map.

There are risks inherent in adopting an Official Map before environmental studies have been completed. Any projects involving federal funds require the unbiased evaluation of alternative alignments. This means that other alternatives will be studied and compared to the protected alignment.

The above information is intended as a brief introduction to Official Maps, describing only a small portion of the information needed to develop one. The Program and Policy Branch of the North Carolina Department of Transportation is responsible for assisting with the adoption of Official Maps. Cities considering Official Map projects should contact this Branch for their "Guidelines for Municipalities Considering Adoption of Roadway Corridor Official Maps" at:

Programming and Policy Branch
NC Department of Transportation
P.O. Box 25201
Raleigh, North Carolina 27611

Urban Renewal

Although urban renewal generally does not play a major role in the implementation of transportation plans, under certain circumstances renewal programs can create valuable opportunities for advancing specific elements of a transportation plan.

Provisions of the New Housing Act of 1974 (as amended) call for the conservation of desirable areas, rehabilitation of declining areas, and clearance of blighted areas. Changes to the transportation system made under this program are generally not controversial or disruptive in comparison to the impacts of the renewal project as a whole. In fact, transportation improvements often play an important role in economic revitalization. Any renewal program should coordinate closely with the Thoroughfare Plan to insure compatibility in areas such as set-back requirements and right-of-way dedications.

Development Reviews

Driveway access to a State-maintained street or highway is controlled by the District Engineer's office and by the Traffic Engineering Branch of the North Carolina Department of Transportation. Any development expected to generate large volumes of traffic (i.e., shopping centers, fast food restaurants, large industries, etc.) may be reviewed by staff from the Traffic Engineering, Planning and Research, and Roadway Design Branches of NCDOT. Minor changes suggested early in the planning process can often substantially improve a development's accessibility at minimal expense. Since the municipality is the first point of contact for developers, it is important that the municipality advise them of this review requirement, and encourage cooperation in the review process.

Capital Improvement Programs

Capital programs coordinate planning with projected revenues. The capital improvements program, with respect to transportation, is a long-range plan for financing street improvements, right-of-way acquisition, and other improvements. Municipal funds should be available for improving streets that are under municipal responsibility, for sharing right-of-way costs on facilities designated as Division of Highways responsibilities, and for advance purchasing of rights-of-way.

Historically, cities and towns have depended heavily on Federal or State funding to solve their transportation problems. Chapter 136-Article 3A of the Road and Highway Laws of North Carolina clearly outlines the responsibilities and obligations of the various governmental bodies regarding highway improvements. North Carolina Highway Bill 1211, passed in 1988, sets specific limits on municipal participation in right-of-way cost sharing.

Set-back regulations and right-of-way dedications and reservations play a major role in the ultimate cost of many facilities. Only by sharing the burden of these expenses can municipalities expect to enjoy the benefits of continued thoroughfare improvements.

Other Funding Sources

1. Assess impact fees to fund transportation projects. These fees, called "facility fees" in the enabling legislation, should be based on "reasonable and uniform considerations of capital costs to be incurred by the town as a result of new construction. The facility fee must bear a direct relationship to additional or expanded public capital costs of the community service facilities to be rendered for the inhabitants, occupants of the new construction, or those associated with the development process."

2. Enact a bond issue to fund street improvements.

3. Maintain efforts with NCDOT to place local projects in the Transportation Improvement Program (TIP).

4. Obtain federal funds for specific projects that qualify as demonstration projects.

5. Adopt a collector street plan that assesses buyers or property owners for street improvements.

6. Charge a special assessment for utilities; for example, increase water and sewer bills to cover the cost of street improvements.

APPENDIX A

THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

Typical Cross Sections

Figure A.1 and Table A.1 refer to the typical cross sections recommended by the Statewide Planning Unit.

Cross section "A" is used for controlled-access freeways. The 46 foot grassed median is the minimum desirable width, but design considerations can justify a narrower median. Slopes of 8:1 into 3 foot drainage ditches are desirable for traffic safety. At least 250 feet of right-of-way are typically required, depending on the amount of cut and fill.

Cross section "B" is appropriate for four-lane divided highways in rural areas when there is little or no control of access. The minimum median width for this cross section is 30 feet, but a wider median is preferable. Design requirements for slopes and drainage are similar to those of cross section "A", although right-of-way constraints may necessitate some variation.

Cross sections "C" and "D" (seven-lane and five-lane urban), are typical of major thoroughfares where frequent left turns are anticipated due to abutting development or numerous street intersections.

Cross sections "E" and "F" are used on major thoroughfares when left turns and intersecting streets are infrequent. Left turns should be restricted to a few selected intersections.

Cross section "G" is recommended for urban boulevards or parkways to enhance aesthetics and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 feet is recommended, although a width of at least 30 feet is desirable.

Cross section "H" is appropriate when travel projections indicate a need for four travel lanes, but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane is usually required at major intersections.

Cross section "I" is suggested for thoroughfares intended to carry one-way traffic, or for lower-volume two-way traffic with frequent left turns.

Cross sections "J" and "K" are usually recommended for minor thoroughfares, since these facilities usually serve both land service and traffic service functions. Cross section "J" is used on minor thoroughfares if parking will be needed on both sides of the street.

Cross section "L" is used in rural areas, or for staged construction of wider multilane cross sections. In such cases, traffic projections often indicate that two travel lanes will be adequate for a considerable period of time.

The curb and gutter urban cross sections all include a sidewalk adjacent to the curb, with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If additional separation between the street and sidewalk is desired for pedestrians movement or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback.

Rights-of-way shown for the typical cross sections are the minimum required to contain the street, sidewalks, utilities, and drainage facilities. Additional right-of-way or construction easements may be needed to satisfy cut and fill requirements. Significant cost savings are making the use of construction easements an increasingly attractive option in urban thoroughfare construction.

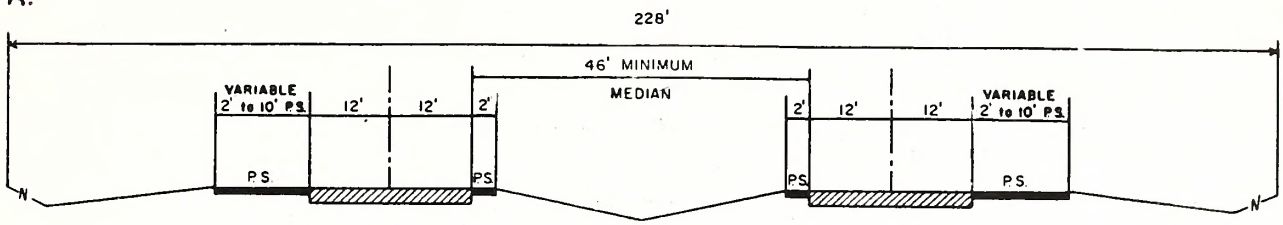
If sufficient bicycle traffic is anticipated along a thoroughfare, additional right-of-way may be warranted for a bicycle lane or bikeway. The North Carolina Bicycle Facility and Program Handbook should be consulted for design standards for bicycle facilities.

The typical thoroughfare cross section recommendations are based on projected traffic volumes, existing capacities, desirable levels of service, and available rights-of-way.

Figure A.1

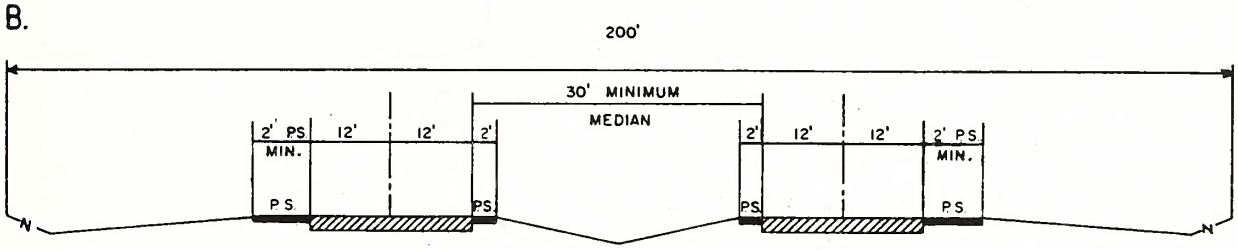
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



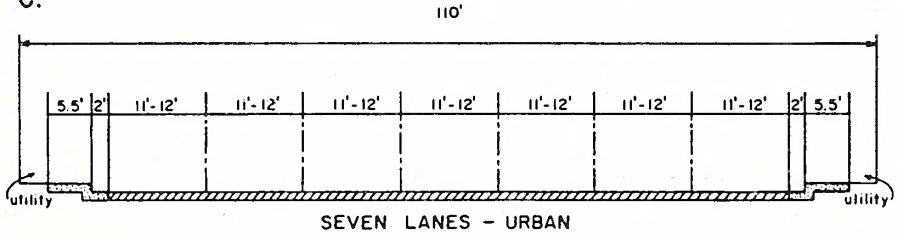
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



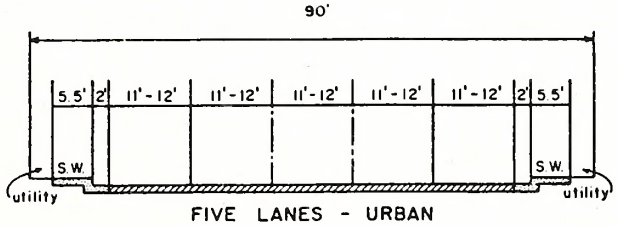
FOUR LANES DIVIDED WITH MEDIAN - RURAL

C.



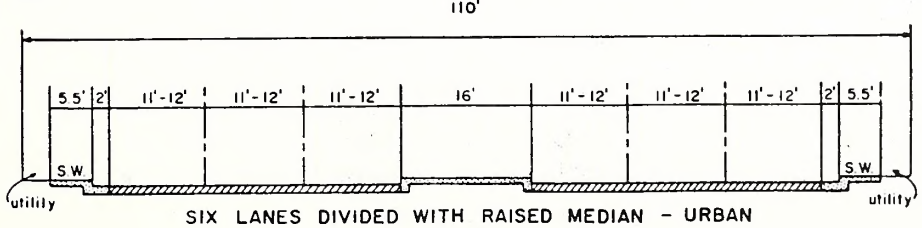
SEVEN LANES - URBAN

D.



FIVE LANES - URBAN

E.



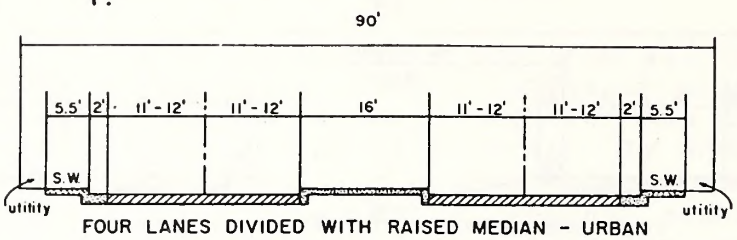
SIX LANES DIVIDED WITH RAISED MEDIAN - URBAN

Figure A.1

TYPICAL THOROUGHFARE CROSS SECTIONS

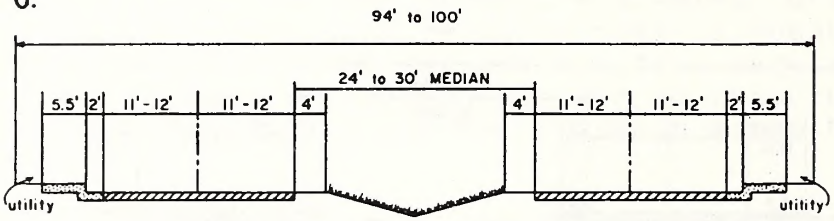
(CONTINUED)

F.



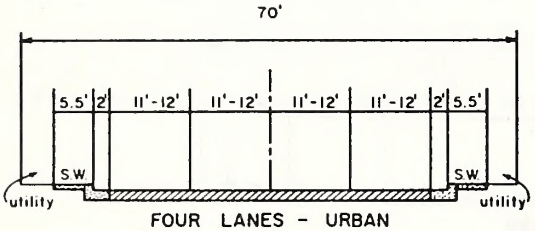
FOUR LANES DIVIDED WITH RAISED MEDIAN - URBAN

G.



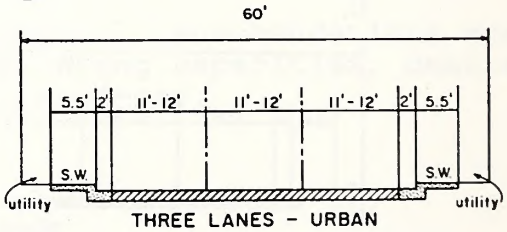
FOUR LANES DIVIDED - URBAN BOULEVARD
GRASS MEDIAN

H.



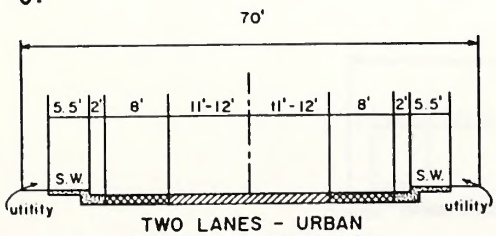
FOUR LANES - URBAN

I.



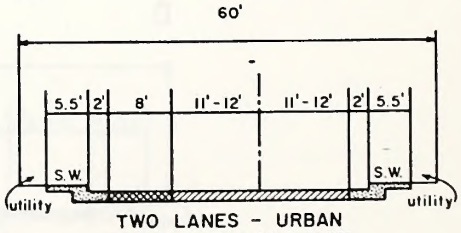
THREE LANES - URBAN

J.



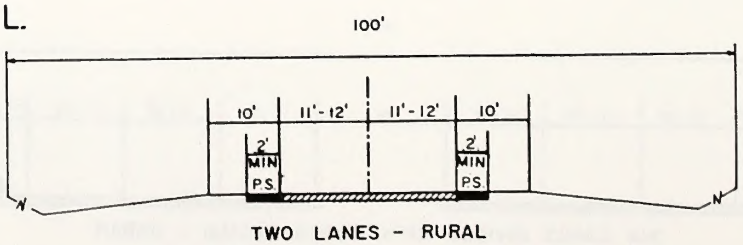
TWO LANES - URBAN
PARKING ON EACH SIDE

K.



TWO LANES - URBAN
PARKING ON ONE SIDE

L.



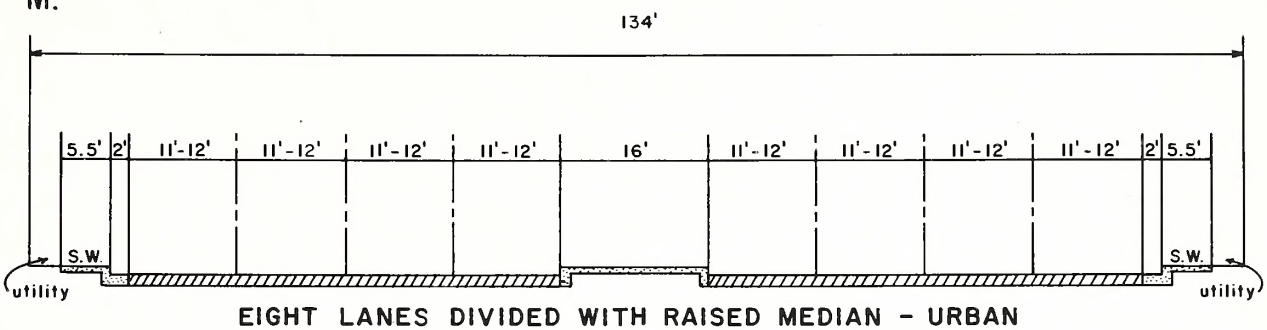
TWO LANES - RURAL

Figure A.1

TYPICAL THOROUGHFARE CROSS SECTIONS

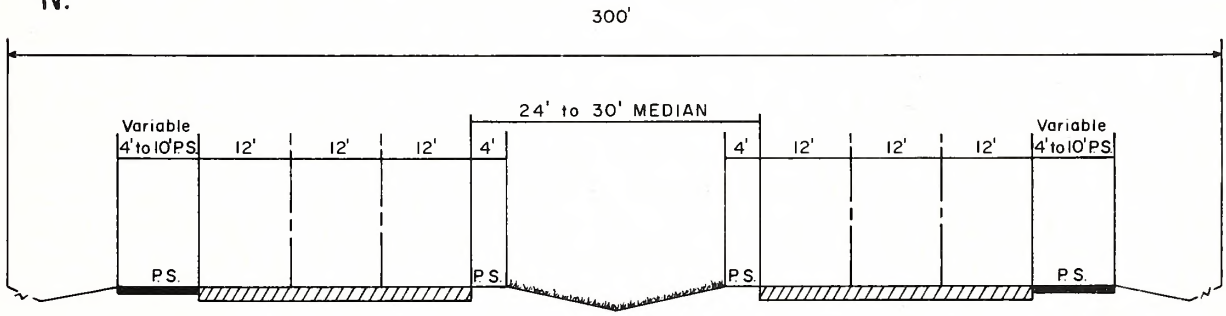
(CONTINUED)

M.



EIGHT LANES DIVIDED WITH RAISED MEDIAN - URBAN

N.



SIX LANES DIVIDED - RURAL FREEWAY
GRASS MEDIAN

TABLE A.1

THOROUGHFARE PLAN STREET TABULATIONS AND RECOMMENDATIONS

FACILITY & SECTION	EXISTING X-SECTION			CAPACITY	VOLUMES		RECOMMENDED X-SECTION	
	DIST mi	RDWY ft	ROW ft	Existing (Future)	1991 ADTS	2015 ADTS	RDWY	ROW
BRYSON STREET								
Everett St - Ramsear St	0.17	[20]	NA	6,500	NA	2,000	J	70*
MITCHELL STREET								
Slope St - Everett St	0.19	[24]	NA	10,000	1,500	2,300	J	70
RAMSEUR STREET								
Bryson St - Locust St	0.10	[20]	NA	6,500	NA	2,000	J	70*
SR 1152 (HUGHES BRANCH ROAD)								
Jenkins Branch - US 19	0.55	18	60	3,500	850	1,700	L	100*
SR 1159 (SPRING STREET)								
US 74 - Main Street	0.72	52	80-100	21,500	4,500	9,100	ADQ	ADQ
SR 1168								
US 19 - 0.40 mile East	0.40	20	[80]	6,500	1,400	2,500	L	100*
0.40 mile East - East Cordon	0.52	24	80	8,500	1,400	2,500	ADQ	ADQ
SR 1321 (GIBSON STREET)								
Everett St - Slope St	0.18	24	[60]	10,000	2,500	5,100	ADQ	ADQ
Slope St - Pine St (SR 1369)	0.43	16	[60]	4,000	1,300	2,400	L	100*
Pine St - Elmore St (SR 1369)	0.66	16	[60]	4,000	800	1,400	L	100*
Elmore St - SR 1322	0.51	16	[60]	4,000	400	700	L	100*
SR 1322								
SR 1321 - SR 1323	0.50	16	60	3,000	350	600	L	100*
SR 1323 (SLOPE STREET)								
US 19 - Mitchell St	0.15	24	[60]	10,000	3,400	6,900	H/J	70
Mitchell St - Gibson Ave	0.08	24	[60]	10,000	3,400	6,900	H/J	70
Gibson Ave - SR 1328	0.63	16	60	4,000	1,600	3,300	L	100*
SR 1328 - SR 1322	0.77	16	60	4,000	800	1,400	L	100*
SR 1328								
Slope Street - SR 1365	0.51	16	60	2,500	400	700	L	100*
SR 1365 - Fontana Rd	0.43	16	60	2,500	500	900	L	100*
Fontana Rd - Toot Hollow Rd	0.39	16	60	2,500	500	900	L	100*

ADQ - Adequate **NA - Not Available** *** - Maximum** **[ ] - Estimated**

TABLE A.1 (Continued)
THOROUGHFARE PLAN STREET TABULATIONS AND RECOMMENDATIONS

FACILITY & SECTION	EXISTING X-SECTION DIST mi	RDWY ft	ROW ft	CAPACITY Existing (Future)	VOLUMES 1991 ADTS	2015 ADTS	RECOMMENDED X-SECTION RDWY	ROW
SR 1333 (WATER STREET)								
SR 1366 - SR 1328	1.41	16	[60]	4,000	1,100	2,000	L	100*
SR 1336 (DEPOT/LOCUST STREETS)								
Fontana Rd - Ramseur St	0.19	16	60	4,500	2,000	4,100	K/J	60/70
Ramseur St - SR 1337	0.52	16	60	4,000	1,600	3,000	L	100*
SR 1337 - SR 1339	0.04	16	60	4,000	300	600	L	100*
SR 1337								
Locust St - SR 1340	0.67	16	60	4,000	1,100	2,100	L	100*
SR 1340 - SR 1333	0.67	16	60	4,000	500	1,000	L	100*
SR 1339								
Locust St - SR 1340	0.58	16	[60]	4,000	1,000	2,000	L	100*
SR 1340								
SR 1337 - SR 1339	0.20	16	[60]	4,500	250	500	L	100*
SR 1364 (EVERETT/FONTANA ST)								
Main St - 0.13 mile North	0.13	44	100	10,000	8,500	17,300	I/J	ADQ
0.13 - 0.23 mile North	0.10	35	100	10,000	8,500	17,300	I/J	ADQ
0.23 - Gibson Ave	0.05	40	100	10,000	8,500	17,300	I/J	ADQ
Gibson Ave - SR 1328	1.04	22	100	8,000	1,100	2,000	ADQ	ADQ
SR 1366								
SR 1333 - SR 1364	0.04	20	[60]	6,500	700	1,300	L	100*
US 19 (MAIN STREET)								
West Cordon - SR 1320	1.14	24	100	8,500	4,300	8,700	I/L	100*
SR 1320 - Jenkins Branch Rd	0.68	24	100-60	6,500	5,800	11,800	H/I	ADQ
Jenkins Branch - Hughes Branch	0.08	24	60	6,500	6,700	13,300	H/I	70/60
Hughes Branch - Slope St	0.55	24	60	8,000	7,300	14,800	H/I	70/60
Slope St - School Dr	0.08	40	60	7,500	8,300	16,800	H	70
School Dr - Everett St	0.17	42	60	7,500	9,300	18,900	I	ADQ
Everett St - Carringer St	0.49	42-20	60	6,500	9,000	17,000	I	ADQ
Carringer St - SR 1166	1.08	20	60	7,000	9,200	16,600	H/I	70/60
SR 1166 - SR 1168	0.45	20	60	7,000	5,200	9,400	I/L	100*
SR 1168 - SR 1350	0.41	20	60	7,000	4,600	8,300	I/L	100*
SR 1350 - East Cordon	0.38	21	60	6,500	4,600	8,300	I/L	100*

ADQ - Adequate **NA - Not Available** *** - Maximum** **[ ] - Estimated**

TABLE A.1 (Continued)

THOROUGHFARE PLAN STREET TABULATIONS AND RECOMMENDATIONS

FACILITY & SECTION	EXISTING X-SECTION			CAPACITY	VOLUMES		RECOMMENDED X-SECTION	
	DIST mi	RDWY ft	ROW ft	Existing (Future)	1991 ADTS	2015 ADTS	RDWY	ROW
US 74								
West Cordon - Hughes Branch Rd	0.91	48	360	35,000	5,200	10,600	ADQ	ADQ
Hughes Branch - Spring St	0.70	48	360	35,000	5,200	10,600	ADQ	ADQ
Spring St - SR 1166	1.22	48	360	35,000	6,600	13,400	ADQ	ADQ
SR 1166 - East Cordon	1.03	48	360	35,000	6,600	13,400	ADQ	ADQ
FRONTAGE ROAD								
Spring St - Hughes Branch Rd	0.70	--	--	(12,000)	--	1,000	L	100*

ADQ - Adequate **NA - Not Available** *** - Maximum** **[ ] - Estimated**

APPENDIX B

RECOMMENDED SUBDIVISION ORDINANCES

DEFINITIONS

I. Streets and Roads:

A. Rural Roads

1. Principal Arterial - A principal arterial is a rural link in a highway system characterized by substantial statewide or interstate travel, and existing solely to serve traffic. This network consists of interstate routes and other routes designated as principal arterials.

2. Minor Arterial - A minor arterial is a rural roadway joining cities and larger towns. It provides intrastate and intercounty service at relatively high speeds, with minimum interference to through movements.

3. Major Collector - A major collector serves major intracounty travel corridors and traffic generators. It supplies access to the arterial system.

4. Minor Collector - A minor collector serves small local communities and traffic generators, and provides access to the major collector system.

5. Local Road - A local road primarily provides access to adjacent land, serving relatively short trips.

B. Urban Streets

1. Major Thoroughfare - A major thoroughfare can be an Interstate, other freeway, expressway, parkway, or major street that provide for the efficient movement of high volumes of traffic within and through urban areas.

2. Minor Thoroughfares - A minor thoroughfare collects traffic from local access streets and carries it to the major thoroughfare system. Minor thoroughfares can supplement the major thoroughfare system by improving minor through-traffic movements, and may also serve abutting property.

3. Local Street - A local street is any street not on a higher order urban system. Its primary function is to provide direct access to adjacent land.

C. Specific Types of Rural and Urban Streets

1. Freeway - A freeway is a divided multilane highway designed to carry large volumes of traffic at high speeds. A freeway provides for continuous traffic flow with no direct access to abutting property. Access is by interchanges at selected crossroads. (Design speed = 70 mph, operating speed = 55-65 mph).

2. Secondary Freeway - A secondary freeway is a divided multilane roadway designed to carry moderate volumes of traffic at moderate speeds. It provides for continuous traffic flow through full access control and the provision of interchanges and grade separations. There is no access at crossroads, and no traffic signals. (Design speed = 50-55 mph, operating speed = 40-45 mph).

3. Parkway - A parkway is a divided multilane roadway limited to non-commercial traffic, with has full or partial access control. Grade separations are provided at major intersections, and there are no traffic signals.

4. Expressway - An expressway is a divided multilane roadways designed to carry heavy volumes of traffic with full or partial access control. Interchanges are provided at major intersections, and there are no traffic signals, although there may be access to service roads and local streets.

5. Secondary Expressway - A secondary expressway is a divided multilane roadway designed to carry moderate volumes of traffic at moderate speeds. It may have partial access control with right-turn-in and right-turn-out access to adjacent property. There may be interchanges at major crossroads, and minor intersections may be signalized.

6. Urban Arterial - An urban arterial is a multilane roadway with signalized intersections, and access to adjacent property. There may be a grass or barrier-type median, or a center left-turn lane.

7. Residential Collector Street - A residential collector is a local street connecting local residential streets with the thoroughfare system. Residential collector streets typically serve traffic from 100 to 400 dwelling units.

8. Local Residential Street - Local residential streets consist of cul-de-sacs; loop streets less than 2,500 feet in length; and other streets less than one mile long that do not connect thoroughfares or serve major traffic generators, and that collect traffic from fewer than 100 dwelling units.

9. Cul-de-sac - A cul-de-sac is a short street with only one end connecting to the street network. The other end terminates permanently in a vehicular turn-around.

10. Frontage Road - A frontage road runs parallel to a limited access facility, providing access to adjacent land.

11. Alley - An alley is a narrow strip of land, owned publicly or privately, set aside primarily for vehicular access to the back side of properties.

II. Property

A. Building Setback Line - This is a line parallel to the street, in front of which no structure shall be erected.

B. Easement - An easement is a grant by a property owner to the public, a corporation, or person(s), for the use of a strip of land for a specific purpose.

C. Lot - A lot is a portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership, for development, or both. The word "lot" is synonymous with the words "plat" and "parcel."

III. Subdivision

A. Subdivider - A subdivider is any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

B. Subdivision - A subdivision is defined as any division of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development, and all divisions of land involving the dedication of a new street or change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or recombination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than ten acres where no street right-of-way dedication is involved, (3) the widening of street openings; (4) the division of a tract in single ownership whose entire area is no greater than two acres into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

C. Dedication - A dedication is a gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

D. Reservation - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep a specific piece of property free from development for a stated period of time.

DESIGN STANDARDS

I. Streets and Roads

The design of all roads within Bryson City shall be in accordance with the accepted policies of the North Carolina Department of Transportation Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) Manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted by the town of Bryson City.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Whenever possible, proposed streets should be created by extending existing streets.

A. Right-of-way Widths - Right-of-way (ROW) widths shall not be less than the following, and shall apply except in those cases where ROW requirements have been specifically established in the Thoroughfare Plan:

	Min. ROW
1. Rural	
a. Principal Arterial	
Freeways	350 ft.
Other	200 ft.
b. Minor Arterial	100 ft.
c. Major Collector	100 ft.
d. Minor Collector	80 ft.
e. Local Road	60 ft.*
2. Urban	
a. Major Thoroughfare other than Freeway and Expressway	90 ft.
b. Minor Thoroughfare	70 ft.
c. Local Street	60 ft.*
d. Cul-de-sac	Variable **

* The desirable minimum right-of-way (ROW) is 60 ft. If curb and gutter is provided, 50 feet of ROW is adequate on local residential streets.

** The ROW dimension will depend on the radius used for the vehicular turnaround. The edge-of-pavement-to-ROW-line distance of the turnaround should not be less than that of the street approaching the turnaround.

The subdivider will be required to dedicate a maximum of 100 feet of right-of-way. In cases where over 100 feet of right-of-way is desired, the subdivider will be required to reserve only the amount in excess of 100 feet. Whenever right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principal arterials, minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than sixty feet wide, may be dedicated if said right-of-way is adjacent to undeveloped property owned or controlled by the subdivider; provided that the width of a partial dedication will permit installation of any facilities that may be needed to serve abutting lots. When the said adjoining property is subdivided, the remainder of the full required right-of-way shall be dedicated.

B. Street Widths - Widths for street and road classifications other than local roads shall be as recommended by the Thoroughfare Plan. Widths of local roads and streets shall be as follows:

1. Local Residential
   Curb and Gutter section: 26 feet, face-to-face of curb
   Shoulder section: 20 feet to edge of pavement, with 4-foot shoulders

2. Residential Collector
   Curb and Gutter section: 34 feet, face-to-face of curb
   Shoulder section: 20 feet to edge of pavement, with 6-foot shoulders

C. Geometric Characteristics - The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under "Right-of-Way" shall apply.

1. Design Speed - The design speed for a roadway should be a minimum of 5 mph greater than the posted speed limit. The design speeds for subdivision-type streets shall be:

DESIGN SPEEDS			
Facility Type	DESIGN SPEED (mph) Desirable	Minimum Level	Rolling
RURAL			
Minor Collector Roads	60	50	40
Local roads including Resid. Collectors & Local Residential	50	50*	40*
URBAN			
Major Thoroughfares other than Freeway or Expressway	60	50	50
Minor Thoroughfares	60	50	40
Local Streets	40	40**	30**

* Based on projected annual average daily traffic of 400-750. In cases where the road will serve a limited area and small number of dwelling units, minimum design speeds can be reduced further.

** Based on projected annual average daily traffic of 50-250.

2. Maximum and Minimum Grades

a. The maximum grades in percent shall be:

MAXIMUM VERTICAL GRADE		
Design Speed	Terrain Level	Rolling
60 mph	4%	5%
50 mph	5%	6%
40 mph	6%	7%
30 mph	--	9%

b. Minimum grade should not be less than 0.5%.

c. Grades for 100 feet each way from intersections (measured from edge of pavement) should not exceed 5%.

d. For streets and roads with projected annual average daily traffic of less than 250, short grades less than 500 feet long may be 150% of the value in the above table.

3. Minimum Sight Distance - In the interest of public safety, no less than the applicable minimum sight distance shall be provided. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1984." Vertical curves that connect each change in grade shall be provided and calculated using the following parameters:

SIGHT DISTANCE				
Design Speed (mph)	30	40	50	60
Stopping Sight Distance				
Minimum (ft)	200	275	400	525
Desirable Minimum (ft)	200	325	475	650
Minimum K* Value for:				
Crest curve	30	80	160	310
Sag curve	40	70	110	160

(General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case.)

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* K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of the vertical curve that will provide the desired sight distance.

4. The "Superelevation Table" below shows the maximum degree of curve and related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

SUPERELEVATION TABLE

Design Speed	Maximum e*	Minimum Radius (Rounded feet)	Maximum Degree Curve (Rounded)
30 MPH	0.04	300	19.00
40	0.04	575	10.00
50	0.04	955	6.00
60	0.04	1530	3.75
30	0.06	275	21.00
40	0.06	510	11.25
50	0.06	850	6.75
60	0.06	1350	4.25
30	0.08	250	22.75
40	0.08	470	12.25
50	0.08	765	7.50
60	0.08	1205	4.75

e*= rate of roadway superelevation, ft/ft

D. Intersections

1. Streets should intersect as nearly as possible to right angles, and no street should intersect any other street or at-grade railroad at an angle less than sixty-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement of the street turnout to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines may be required to provide sight distance for the stopped vehicle on the side street.

3. Offset intersections should be avoided. Intersections which cannot be aligned should be separated by a minimum length of 200 feet between survey centerlines.

E. Cul-de-sacs

Cul-de-sacs shall not be more than five hundred (500) feet long (for control of speed, visual detection of a dead end street, and emergency vehicle access). The distance from the edge of pavement on the vehicular turnaround to the right-of-way line should not be less than the distance from the edge of pavement to the right-of-way line on the street approaching the turnaround. Cul-de-sacs should not be used solely to avoid connection with an existing street or the extension of an important street.

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes, except that this requirement may be waived where other definite and assured provision is make for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least twenty (20) feet.

3. Dead-end alleys shall be avoided where possible. If unavoidable, adequate turnaround facilities shall be provided at the dead-end, as required by the Planning Board.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is must be obtained before beginning any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of the roadway shoulders, preferably a minimum of 30 feet from the edge of pavement. On streets with curbs and gutters, utility poles shall be set back a minimum of 6 feet from the face of the curb.

I. Wheelchair Ramps

Any construction, reconstruction, or alteration of street curbs for maintenance purposes, traffic operations, repairs, correction of utilities, or any other reason, shall include wheelchair ramps at intersections where both curb and gutter and sidewalks are provided, and at other major points of pedestrian flow.

J. Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving two-lane, two-way traffic should be as follows:

   a. Shoulder section approach

      i. Design year ADT less than 800:

         Minimum of 28 feet between faces of rail parapets, or pavement width plus 10 feet, whichever is greater.

      ii. Design year ADT between 800 and 2000:

         Minimum of 34 feet between faces of rail parapets, or pavement width plus 12 feet, whichever is greater.

      iii. Design year ADT over 2000 ADT:

         Minimum of 40 feet between faces of rail parapets, with 44 feet being desirable.

   b. Curb and gutter approach

      i. Design year ADT less than 800:

         Minimum of 24 feet between curb faces.

      ii. Design year ADT greater than 800:

         Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width between curb faces, and in crown drop. The distance from face of curb to face rail parapet shall be 1'-6" minimum, or greater if sidewalks are required.

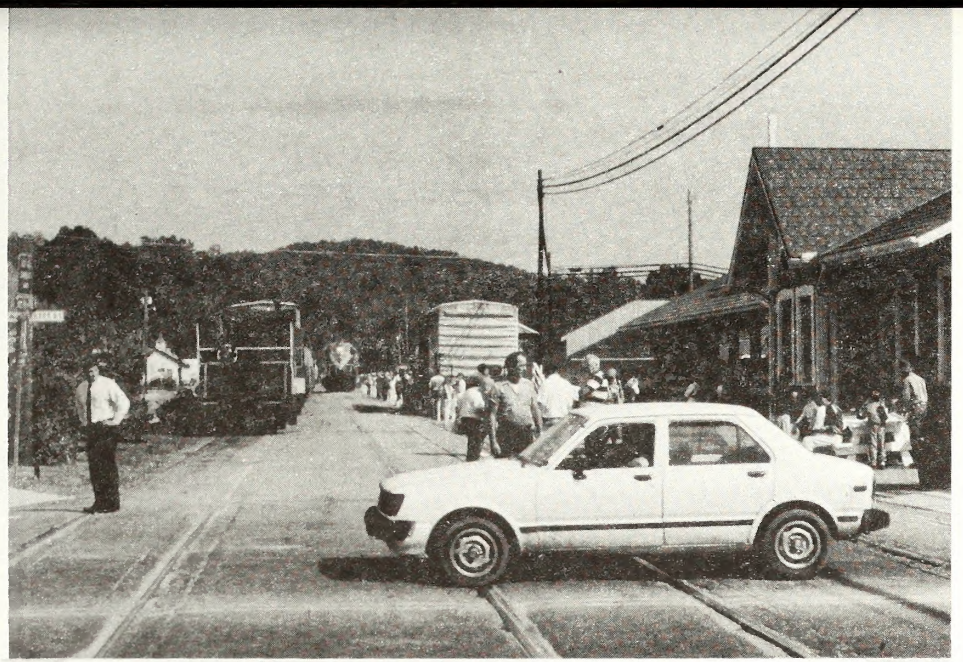
2. The clear roadway widths for new and reconstructed bridges having four or more lanes serving undivided two-way traffic should be as follows:

   a. Shoulder section approach - Minimum width equal to width of approach pavement plus width of usable shoulders on both sides of the approach. (Shoulder width 8' minimum, 10' desirable.)

   b. Curb and gutter approach - Minimum width equal to width of approach pavement between curb faces.

APPENDIX C

Photographs of Existing Conditions



Train-related conflicts: Everett St. north of train depot.

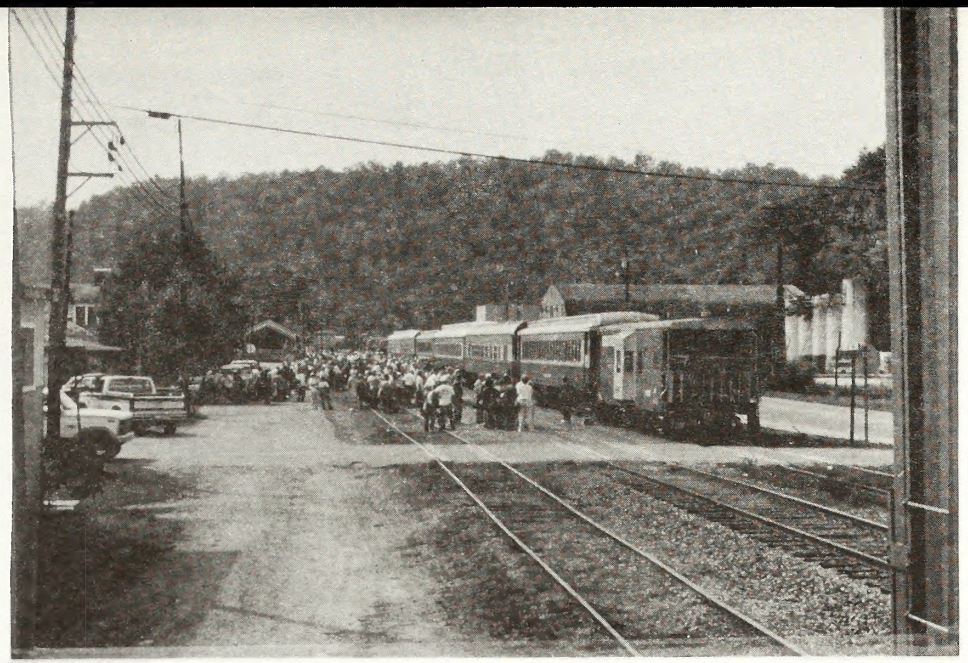
Everett St. looking south from Gibson Avenue.

Train crossing: Intersection of Everett and Depot.

Traffic conflicts: Intersection of Everett and Fry.

Congestion on Everett Street: looking south from Depot St.

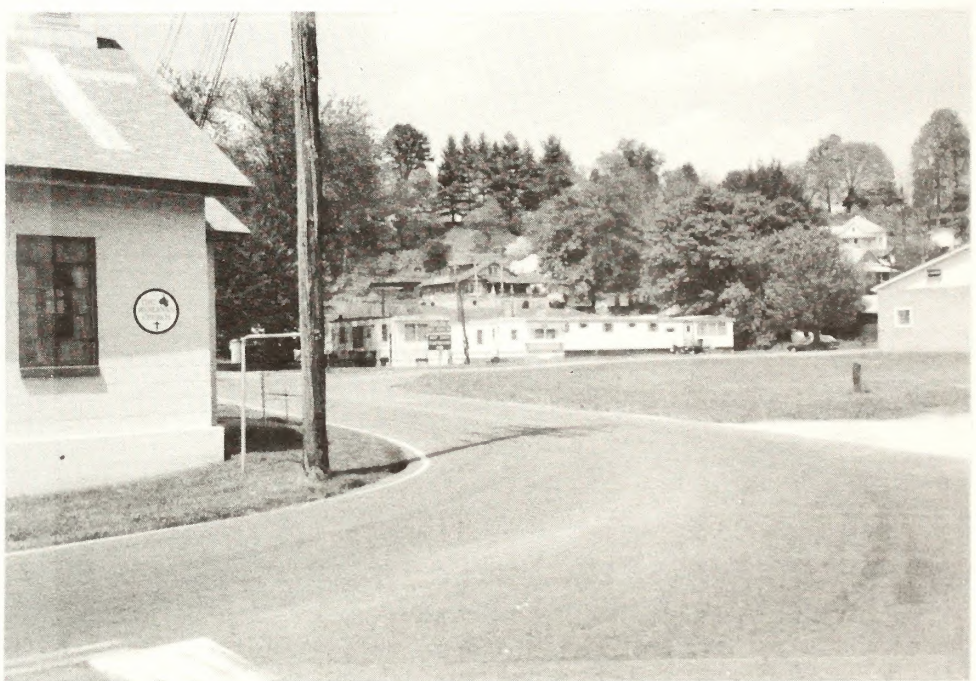
Main Street, looking east towards Everett St.



Train passengers on Fry Street.

Ramseur Street, looking south from Depot Street.

Depot Street, looking west from Ramseur Street.



Depot/Ramseur/Locust Streets, looking north

Spring St. and US-74, westbound entrance ramp.

View of Spring St. from westbound entrance ramp of US-74.